Cement MILL SECTION of

Concrete

Vol. 23 NOVEMBER, 1923 No. 5

Superior Portland Cement Company Occupies New Office

The new laboratory and office building of the Superior Portland Cement Co., Concrete, Wash., has recently been completed and now houses all of the company's office force. The building as shown in the accompanying illustrations is conveniently located with respect to the cement plant, presents a neat appearance on the outside, and is so arranged as to give maximum use of the interior floor space.

The structure is one story and basement high, of monolithic concrete with poured walls and reinforced concrete floors and roof. In plan it is 42 ft. wide and 47 ft. deep. The exterior walls are 10 in. thick for the full height. The location on sloping ground makes the building practically two stories high, the grade line at the back of the building being a little higher than the level of the basement floor. From the basement floor line to the first floor line is 9 ft. and the ceiling of the main floor building is 12 ft. high.

All floors are reinforced slabs resting on beams and finished by a covering of linoleum. The walls and columns are so arranged as to make the lengths of the beams 14, 15 and 16 ft. The beams with a 14-ft. span are 12 in. wide and 8 in. deep, with a 5-in. floor slab poured monolithically. The main beams are reinforced with four ¾-in. square rods each with the exception of one in the first floor under the filing room, which is 20 in. wide and has six ¾-in. square rods. The floor slabs are reinforced two ways with ½-in. square rods, 6 in. o. c. with a top reinforcing for negative moment over all beams or walls of ½-in. rods, 12 in. o. c. The columns are 12 in. square reinforced with four ½-in. square rods each, wrapped with No. 6 wire 6 in. o. c. All stairs, both at the rear and front entrances are constructed of reinforced concrete.

The main floor is occupied by a lobby, main office, filing room, drafting room and two private offices with the necessary hall space, stairway and toilets.

In the basement are the chemical laboratory, physical laboratory, balance room, store room, vaults and hall.

The interior wood finish is varnished Douglas fir. The walls are plastered directly on the concrete and painted.

The building has its own hot water heating plant, located in the basement.

The company has in its laboratory, aside from the usual equipment found in laboratories, a Tyler Rotap screen, an air analyzer for determining percentages of fines in the cement and also a complete microscopic equipment for examining cement and clinker. All hot plates and furnaces are electrically heated. A calorimeter has been installed for determining heat values. The briquette tanks in the physical laboratory are made of reinforced concrete and are arranged in tiers

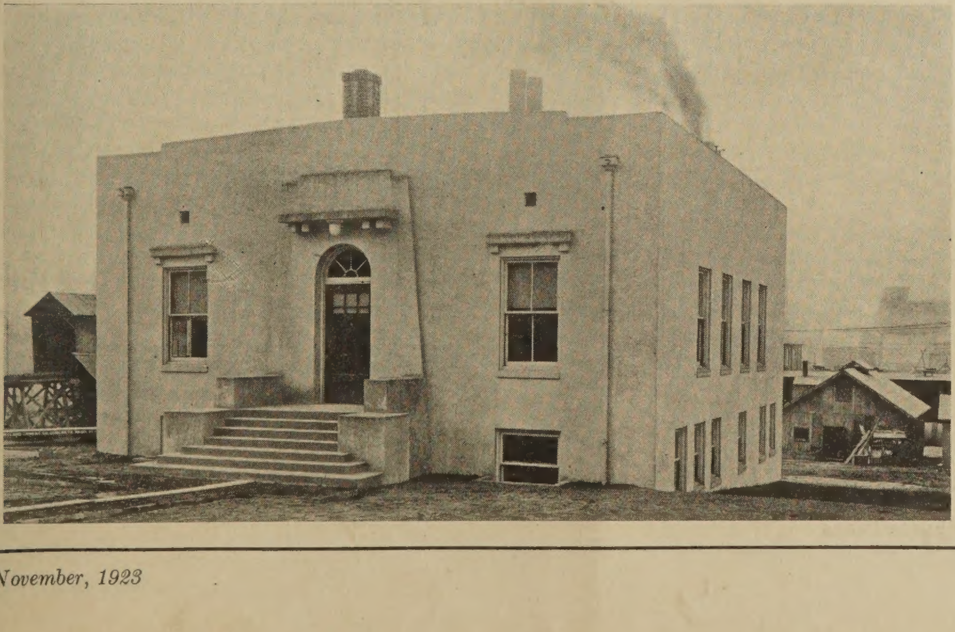
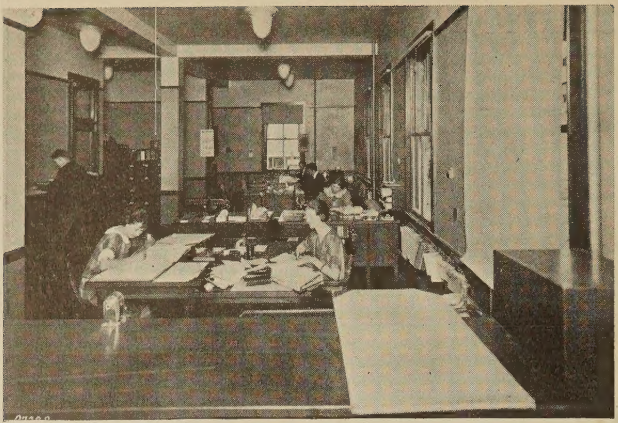


Fig. 1—General View of New Office Building of the Superior Portland Cement Co., Concrete, Wash., with the Plant in the Background



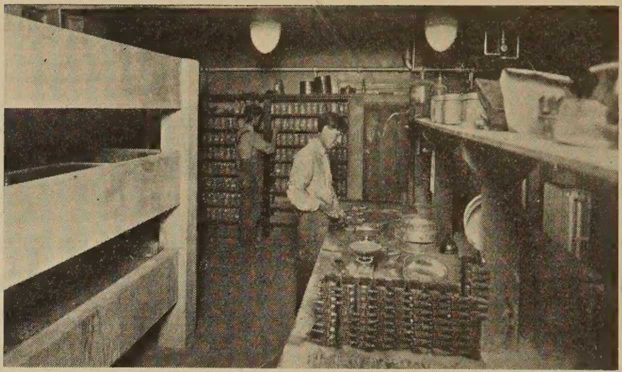


Fig. 4—Physical Laboratory with Reinforced Concrete Briquette Tanks on the Left

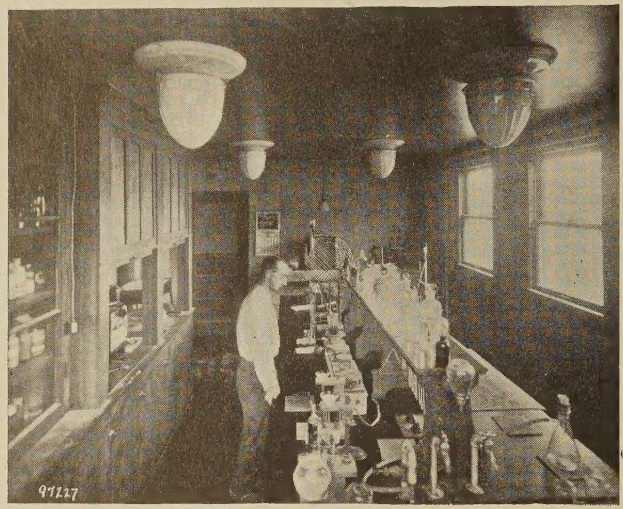


Fig. 2—Interior View of Main Office

Fig. 3—Chemical Laboratory Showing the Layout to Obtain Maximum Amount of Natural and Artificial Light

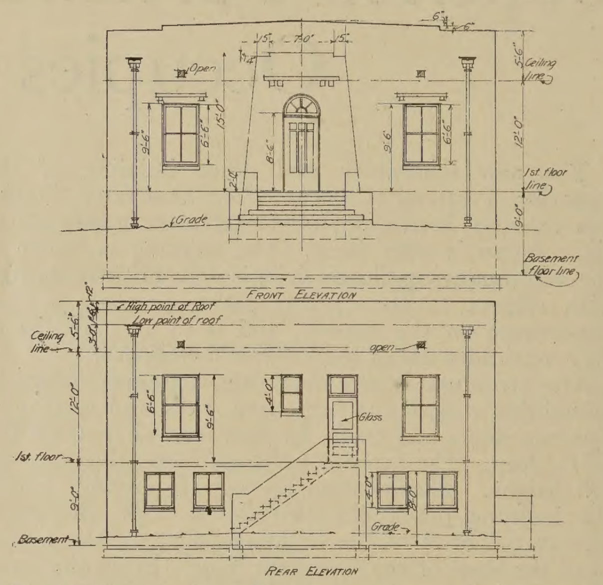


Fig. 5—Front and Rear Elevation of Office Building

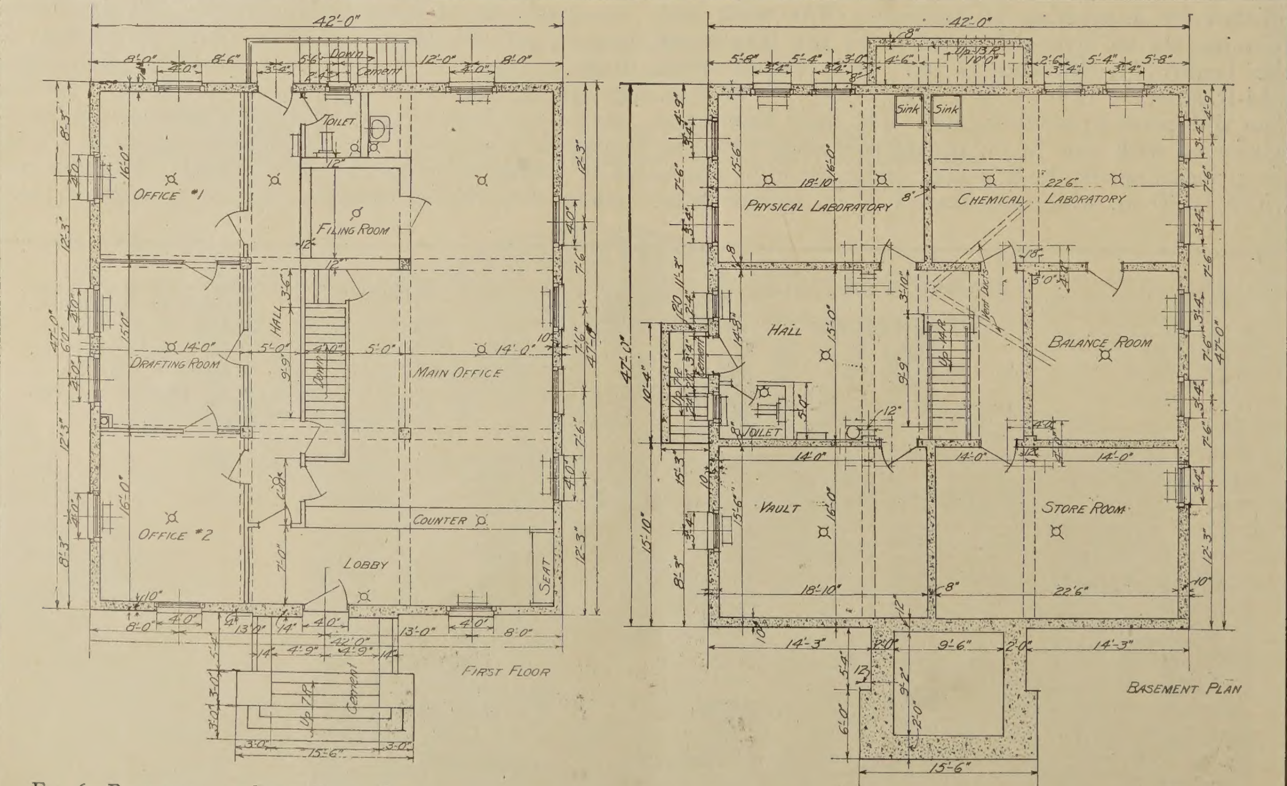


Fig. 6—Basement and First Floor Plans

three tanks high. The most interesting feature of the entire laboratory is the convenient arrangement.

The column footings are 4 ft. square and 14 in. thick. They are reinforced two ways with ½-in. square rods 8 in. o. c. Outside wall footings are 18 in. wide and 12 in. thick surrounded by a tile drain at an elevation below the basement floor. These support the 10-in. exterior walls. The footings for the 8-in. interior walls are 16 in. wide and 12 in. deep.

The building was erected under contract by the Rounds Clist Co., Seattle, Wash., after plans made in the company's own engineering department.

Making a Success of It in the Cement Industry

By Charles Baumberger

The following story by one of the pioneers in the American cement industry, reciting the ups and downs of the early days of the business is presented by courtesy of *Compressed Air Magazine.*

There was a time when the belief prevailed widely that portland cement had to come from England where the outcropping of so-called Portland rock made the manufacture of cement a supposedly local industry. That erroneous understanding was a handicap to the early American cement producers; and it took some years to convince the public at large on this side of the Atlantic that Nature had also furnished us with abundant raw materials from which cement of the highest quality could be made.

For those who may be unfamiliar with the subject, let it be said here that natural cement rock is nothing more or less than a limestone carrying a requisite amount of clay; and this rock, when properly treated, forms the basis of the cement which is used so extensively in building undertakings today. The following story brings to light how an accidental discovery—as has so often been the case—led to the creation of the first cement plant in the United States west of the Mississippi river.

In 1879, an Englishman by the name of William Loyd, while hunting within the northern corporate limits of the City of San Antonio, Tex., happened upon quarries belonging to the municipality and there discovered a blue argillaceous limestone which he thought he recognized as cement rock. Taking a piece of the rock back to town with him, Loyd sought advice lest he be mistaken in his conclusions. He turned his sample over to George H. Kalteyer, a graduate chemist. The latter, after making an analysis, pronounced the material natural cement rock containing about the correct proportions of lime and clay to make a true portland cement.

Thus encouraged, Loyd interested W. R. Freeman, a hydraulic engineer; and together, in a small way, they made some experimental burns from that rock. Having but limited means, however, they turned to Mr. Kalteyer for both financial and technical assistance. Out of that association grew the idea of incorpoating a company to manufacture hydraulic cements; and, accordingly, the Alama Portland & Roman Cement Co. was organized under the laws of Texas on January 15, 1880. The capital stock amounted to $3,100, divided into 124 shares having a par value of $25 each.

The original incorporators were William Loyd, George H. Kalteyer, B. J. Mauerman, F. V. Weise, and W. E. Jones. The author took care of the books of the company at that time for the modest remuneration of $10 a month. That sum to a lad of seventeen was not as small as it looks now. In 1884, opportunity gave me the opening I earnestly desired, and I was made manager of the plant. But don't let us anticipate our story.

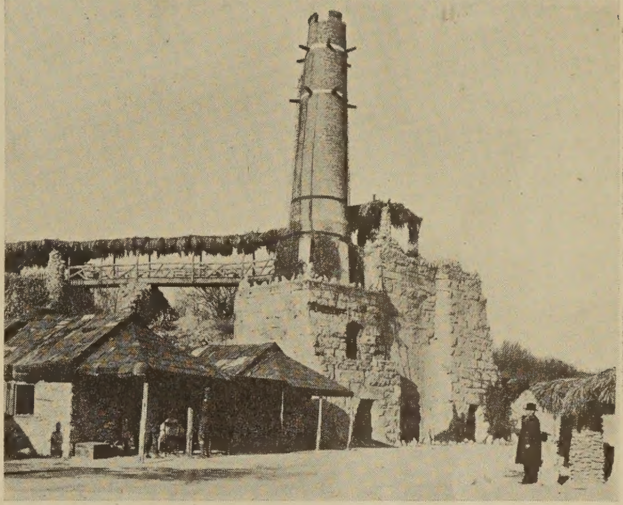
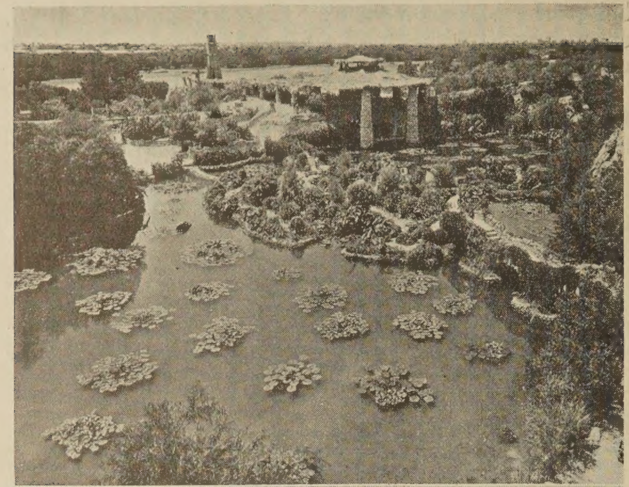


Fig. 1—All That Is Left of the Original Schoefer Kiln of the Alamo Cement Co., Now a Picturesque Feature of Brackenridge Park

The kiln to the left with brick stack is the Schoefer kiln. The scalloping on top and the wooden guns in the stack are ornaments placed by the present Park Commissioner. Immediately to the right of this kiln are two intermittent or pot kilns.

As an outcome of the formation of the company, there was constructed an intermittent pot kiln; and the associate buildings were small and of lumber. The mechanical outfit consisted of a small Blake jaw crusher, a pair of rolls, and a vertical French burr mill. Power was supplied by an unpretentious slide-valve engine, the flywheel of which was composed of a cast-iron rim and wooden spokes. The plant was capable of grinding about ten barrels per diem; and, as there was no American standard to guide us, we tried to follow the European practice and ground to a fineness of 5% residue on a No. 50 cloth. It might be well to state here that all the cement was bolted and that the rejection from the bolt went back to the burr mill.

The mill building had three floors: a ground floor, where we had wooden bins and where the cement was stored after it was seasoned; and two floors above where the seasoning was done by spreading the cement in layers varying in thickness from 6 in. to 9 in. The cement, while seasoning, was aërated by turning it over with shovels once a week and by testing it from



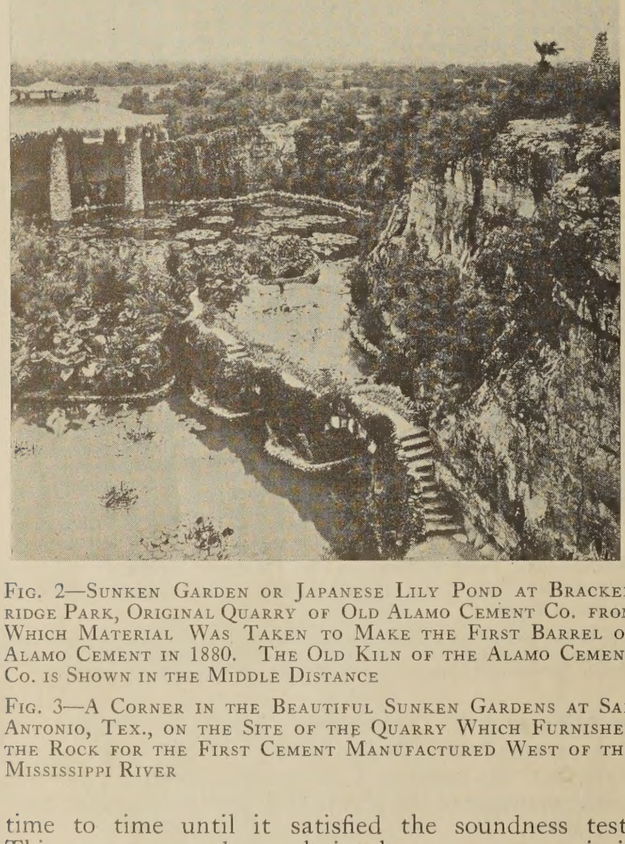


FIG. 2—SUNKEN GARDEN OR JAPANESE LILY POND AT BRACKENRIDGE PARK, ORIGINAL QUARRY OF OLD ALAMO CEMENT CO. FROM WHICH MATERIAL WAS TAKEN TO MAKE THE FIRST BARREL OF ALAMO CEMENT IN 1880. THE OLD KILN OF THE ALAMO CEMENT CO. IS SHOWN IN THE MIDDLE DISTANCE

FIG. 3—A CORNER IN THE BEAUTIFUL SUNKEN GARDENS AT SAN ANTONIO, TEX., ON THE SITE OF THE QUARRY WHICH FURNISHED THE ROCK FOR THE FIRST CEMENT MANUFACTURED WEST OF THE MISSISSIPPI RIVER

time to time until it satisfied the soundness test. This test was made much in the same way as it is carried out now, but in those days we were ignorant of the boiling test and depended entirely upon the cold-water test to determine soundness. No wonder we occasionally shipped "green cement." The plant was located close to the quarries but fully three miles distant from the nearest railroad. This was a handicap because all fuel had to be hauled to the mill and the finished product similarly transported to the city.

The outlook as many of our acquaintances saw it was not a promising one, and we had our full share of Job's comforters. The county poorhouse was then located adjacent to the mill, and we were often jokingly reminded, "Well you're right next to the poorhouse, and there should be consolation in the thought that you won't have to go far when the venture fails."

The burning of the cement rock was done by making alternate layers of fuel and rock—the fuel being coke. It took about a week to burn a kiln, and the result was something like 120 barrels of cement. The output of the kiln, after burning and cooling, was hand-picked; and that portion which clinkered was classed as portland cement while the remainder was used for making natural or so-called Roman cement.

The quarry overburden was limestone containing from 10 to 15% of clayey matter. Upon burning, this material produced a hydraulic lime; and the stuff helped to pay for removing the overburden in order to get at the cement rock. In fact, the company found it necessary to engage in the lime business and in the sale of building stone so that it might eke out a precarious existence. However, the tide turned favorably before the end of the second year, and we had reason to believe that we had not undertaken to carry through a forlorn hope.

Before 1881 came to a close, the business had grown sufficiently to warrant erecting another kiln, and on the 1st of December of that year the capital stock was increased to $10,000—each share being valued at $25. The charter was then amended to read "Alamo Cement Company." The sales of our product had assumed what seemed to us enormous proportions, that is, 1,000 barrels a year; and our commercial enthusiasm was such that we deemed ourselves the foremost producers in the world. Texas was not then as interested as she is now in what outsiders were doing—her industrial horizon was a comparatively limited one.

Forty-two years ago we charged $18 a short ton for Roman cement and $22.50 a ton for portland cement, in bulk. The gross weight of a barrel of Roman cement was 300 pounds, and the similar weight of a barrel of portland cement was 400 pounds. We charged $3.25 for the Roman cement and $5 for the portland cement, in cooperage. No attempt was made to put up the cement in sacks of uniform weight for shipment, and a bag might weigh anywhere from 150 to 250 pounds.

Our main business was in lime and building stone, and we burned cement only occasionally: the same kilns being used for burning both the cement and the lime. Owing to the fact that we were not able to induce contractors to use our cement in laying sidewalks—indeed, experienced difficulty in marketing our product, we were forced, in self defense, to go into the sidewalk business so as to find an outlet for our surplus. As an aid in promoting this departure we obtained the right to use in the State of Texas what was known as the "Schillinger patent." The Schillinger patent covered the process of subdividing concrete sidewalks and floors into blocks for the purpose of controlling expansion and contraction. The right cost us $1,000; but the money was well spent, because we were able to collect a royalty on all sidewalks constructed in that manner in the state. To those who used our cement the royalty was at the rate of 2c per sq. ft. while the charge was 5c per sq. ft. when foreign cement was employed.

The sidewalk business was not a source of unmixed satisfaction. As already mentioned, the cold-water test was our only means of determining soundness, and every now and then we utilized unintentionally unsound cement. As a result, a sidewalk, after being down several days, would occasionally bulge and swell by reason of the expansive force of free lime. Our partiuclar concern was to deal with this situation before it attracted general attention; and more than once in the dead of night we tore up the work and replaced it as quickly and silently as possible. Our practice was to cover the walks with planks for protection, and to water the concrete twice a day—making observations at the same time by lifting the boards. This procedure gave us a chance to note what was going on without exposing our work to public gaze.

Back in the "eighties," General Q. A. Gillmore, then a lieutenant-colonel of engineers in the United States

Army, was a recognized authority because of his well-known book, *Hydraulic Limes and Cements*. Inspired by the desire to win wider confidence in our product, we prevailed upon the mayor of the City of San Antonio and the municipal engineer to take at random from our stock samples of portland cement and Roman cement; to put them under seal; and to send them to General Gillmore to be tested for both tensile and compressive strength. This was in May of 1881; and the report by that officer was highly commendatory. Thereafter, business grew steadily better.

By 1889, the demand for cement had increased sufficiently to justify the company in making further improvements. We built an upright shaft kiln of the Schoefer type, and ground the raw material first on French burrs or millstones, adding water, and then passed it through a pug mill. This mud was next made into bricks and the bricks were put on pallets and conveyed outside for air drying. After drying, the bricks were fed into the kiln for burning. This procedure proved economical in fuel consumption, for we were able to burn portland cement clinker with 15% of bituminous coal and to produce an average of 50 barrels daily. The method was continued until 1897, when still other improvements were given consideration. At that date, the rotary kiln had been adopted by the leading plants located in the Lehigh Valley of Pennsylvania; but we had no oil in Texas at that time, and none was discovered until four years later. Our problem was therefore, to find a way to use the rotary kiln but with some other fuel.

From a German publication we learned that powdered coal was being successfully fired under boilers, and it occurred to us that possibly the DeCamp system might also be utilized in rotary kilns. Mr. Kalteyer went to Europe and while there purchased one of the DeCamp apparatus as well as a mill for grinding coal. Unfortunately, he died in August of 1897, shortly after his return to the United States, and the task of carrying out the plans fell to the writer. We bought a 50-ft. rotary kiln from W. F. Moser & Son of Allentown, Pa.; and we were able to burn portland cement with powdered coal until 1901 when, upon the discovery of petroleum in Texas, we adopted fuel oil.

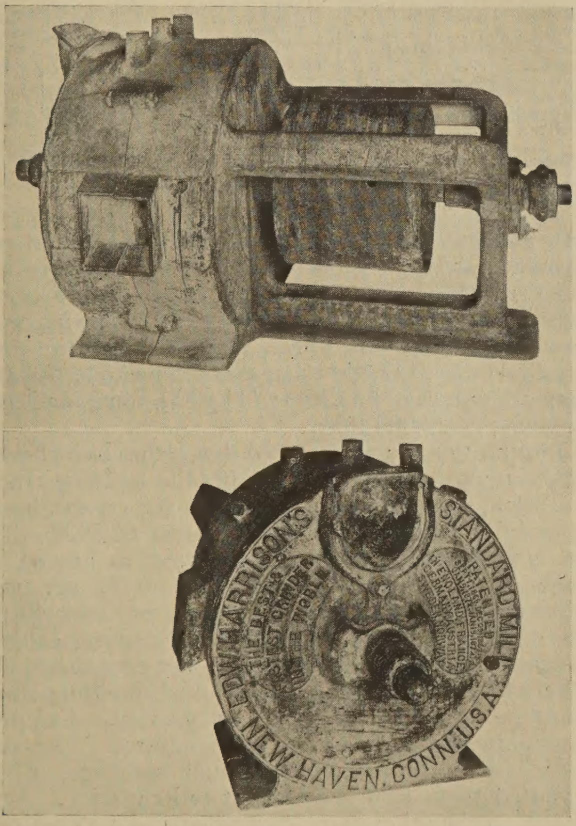
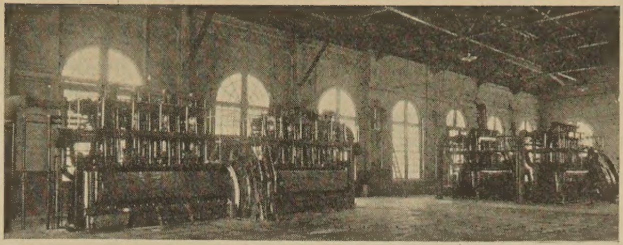

EDW. HARRISON'S
STANDARD MILL
NEW HAVEN, CONN. U.S.A.
THE BEST & FASTEST GRINDER IN THE WORLD
PATENTED
IN ENGLAND, FRANCE, GERMANY, AUSTRIA, SWEDEN & NORWAY

FIG. 4—ORIGINAL MILL USED BY ALAMO CEMENT CO. FOR GRINDING CEMENT

Note inscription "Best and fastest grinder in the world." It ground about 10 to 12 barrels of cement per day of 10 hours.



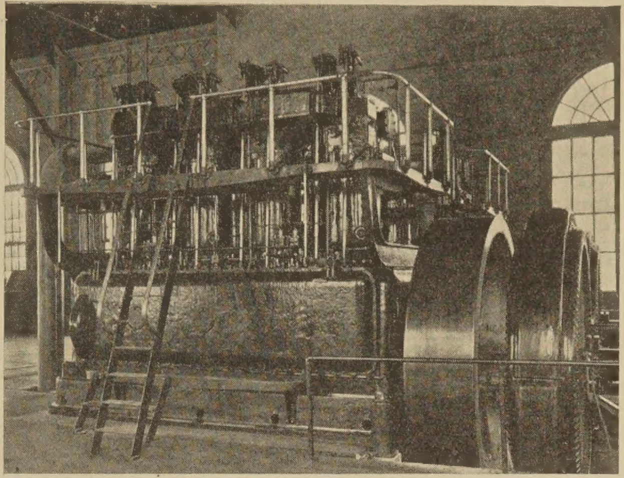


FIG. 5—A GENERAL VIEW OF THE POWER PLANT OF THE SAN ANTONIO PORTLAND CEMENT CO. SHOWING THE DIRECT-CONNECTED, 1,000 B. H. P. PRICE-RATHBUN OIL ENGINE ON THE LEFT AND THE TWO 480-B. H. P. UNITS OF THE SAME MAKE AT THE RIGHT

FIG. 6—CLOSE-UP OF ONE OF THE TWO 480-H. P. PRICE-RATHBUN OIL ENGINES AT THE PLANT OF THE SAN ANTONIO PORTLAND CEMENT CO.

The demand for our cement had so increased by 1908 that the old mill was no longer able to satisfy the market; and for various reasons we decided to abandon the original site and to relocate on a larger scale where we would be in close touch with the railway. As part of the scheme of expansion, the company changed its name and was incorporated as the San Antonio Portland Cement Co. As previously mentioned the writer entered the service of the original company in October 1880. Ten years later he became secretary, in addition to exercising the office of manager, and in 1897, upon the death of Mr. Kalteyer, he was made president.

Notwithstanding the fact that petroleum was to be had in Texas in 1911, when the company was brought face to face with the need of considerably amplifying it power plant, still this fuel was by no means as cheap as Texas lignite which could be delivered at the works for $1.50 a ton. The utilization of either bituminous or anthracite coal was out of the question because of the high prices of those fuels. Therefore, the problem was to find a satisfactory way to use the native lignite.

About that date, the Smith Gas Power Co. of Lexington, Ohio, developed a lignite-coal gas producer which, in connection with the producer gas engine, offered an economical solution of the prime-mover problem. Accordingly, the San Antonio Portland Cement Co. decided to install an equipment of that nature. That outfit was composed of a 4-cylinder, 21½ x 24-in. Rathbun vertical gas engine, developing 500 H. P. at 200 R. P. M., and of Smith gas producers. H. O. Rinehold was in charge of the erection of this plant, and after completing that work he continued on as operating engineer. In 1912, the cement company purchased additional gas producers and another engine of the type and size just described. These engines were directly connected to 3-phase, 60-cycle, 480-volt Crocker-Wheeler generators. As a result of the excellent performance of the gas engines, a third unit of the same make was purchased in 1913. That machine had 8 cylinders of 21½-in. bore and 24-in. stroke, and at 200 R. P. M. it developed 1,000 H. P. The engine was directly connected to a General Electric generator. Mr. Rinehold became chief engineer and operated the power plant until 1920, when he was made plant manager of the entire mill.

Engineering progress and other factors brought to a focus in 1922 the question of still another change in the power equipment; and a careful study of the situation revealed that the wisest step would be to substitute oil for producer gas as a motor fuel. It was therefore decided to remodel the gas engines so that they could be operated as oil engines by the Price direct-injection system.

The reasons for changing the engines were: the cost of lignite, which had advanced from $1.50 to $3.25 a ton; the increased price of labor required to run the producers; the badly worn condition of the producers; and the fact that the engines, themselves, because of hard and continuous service, were in need of extensive overhauling. A further contributing factor was that the company had arranged for the use of fuel oil throughout the mill. There is ample warrant for the belief that the remodeled engines are $100 a day more economical than they were when working on producer gas.

The oil employed is from the Laredo field in Texas, and is known as Mirando crude. It contains 19,200 B. T. U.'s per lb.; has a specific gravity of 22 Baumé; and weighs approximately 7.68 lbs. per gallon. Taking the total number of kilowatt-hours generated in 1922, and the total amount of fuel oil purchased at $1.60 per 42-gal. barrel, the fuel consumption was .54 lb. per kilowatt-hour. The overall efficiency of the generators, including excitation losses and windage, should be figured at 92%. This would mean .3714 lb. of this particular fuel per brake horsepower. It is authoritatively stated that approximately 18 kilowatt-hours of current are required per barrel of cement when manufactured in a modern mill where all the equipment is electrically driven. The cost of providing current with the gas-producer plant was on the basis of .7c per kilowatt-hour as compared with .4c per kilowatt-hour with the oil-engine plant. A consumption of three pounds of lignite per brake horse-power-hour, including stand-by losses, was formerly needful. The lubricating oil used during the year 1922 amounted to the equivalent of one gallon per 4,000 rated horse-power hours.

In conclusion, it might be said that the present capacity of the San Antonio Portland Cement Co. is 1,500 barrels per diem; and that improvements are in hand that will shortly make it possible for the mill to turn out 2,400 barrels daily. Looking back to our start in 1880, it is plain that we have traveled far along the industrial highway; and it is our intention to keep pushing forward by utilizing every mechanical delevopment, every engineering advance that will make for economy of operation and increased output.

German Limestone Production

Raw limestone to the amount of 10,200,000 tons was broken up in Germany in 1922, according to the Limestone Union. Out of this quantity, 2,400,000 tons were sold raw, while the rest was further worked up in refining works.

Production was divided between 633 works, employing about 25,000 persons. The output reported for 1921 and 1922 was as follows:

German Production of Limestone

	1921	1922
	Metric tons	Metric tons
Quicklime	4.048,000	4,354,000
Fat lime in lumps (acetate)	2,630,000	2,800,000
Other lumps	805,000	777,000
Ground quicklime	613,000	777,000
Sinter dolomite	143,000	161,000
Marly limestone	694,000	689,000
Ground raw limestone	116,000	115,000

Entire Production Sold in 1922

Sales of limestone were very active in 1922, as well as in the previous year, the entire production being consumed. Most of the products were disposed of locally. Small quantities only were exported to the Netherlands, Denmark, and Czechoslovakia. According to reports from the works, total exports amounted to but 47,109 tons, of which 29,668 tons were quicklime.

Inland and export sales in 1922 were distributed among the following consuming groups:

Sales of German Limestone in 1922

Consuming group	Quick-lime	Sinter dolomite	Marly limestone	Ground limestone	Raw limestone
	Metric tons	Metric tons	Metric tons	Metric tons	Metric tons
Building trades	1,867,628	....	....	....	249,421
Iron and steel works	996,137	154,919	....	....	1,766,837
Agriculture	544,543	....	565,618	56,559	....
Calcium-cyanamide manufacturers	239,045	....	30	....	....
Other chemical manufacturers	315,142	....	....	....	123,038
Sugar factories	7,568	....	....	....	198,300
Calcareous-sandstone manufacturers	197,082	....	....	....	5,234
Alluvial building stone manufacturers	126,524	....	224	....	....
Other consumers	11,073	752	21,621	51,772	46,758
Export	29,668	11,336	2,500	2,826	769
Total	4,334,410	167,007	*680,993	111,157	2,390,357

*Includes 91,000 tons unallocated.

An increase in quicklime, sinter dolomite, and raw limestone sales and a decrease in those of marly and ground raw limestone are apparent if the totals of the preceding table are compared with the following sales figures for 1921: quicklime, 4,032,000 metric tons; sinter dolomite, 142,000 tons; marly limestone, 700,000 tons; ground raw limestone, 113,000 tons; and raw limestone, 2,032,000 tons.

Consumption was increased by some branches in 1922, compared with 1921. Thus, the building trades used more, presumably as a result of the greater building activity in the spring and summer of 1922. The iron and steel industries are reported as having increased consumption by an average of 12 per cent, while calcareous sandstone manufacturers took 40 per cent more; the chemical industry (excepting calcium cyanamide manufacturers) used 22 per cent more; and the amount required by the alluvial building stone manufacturers was 19 per cent greater. Calcium-cyanamide plants, however, only required 2 per cent more—largely on account of fuel shortage, which prevented them from working at full capacity. Agriculture, on the other hand, consumed about 19 per cent less than in 1921, despite the ever-growing need of more intensive fertilizing to offset the food shortage, while sugar factories took 11 per cent less in 1922 than during the previous year.—*Commerce Reports.*

Cement Section National Safety Council Meets

Methods for eliminating powdered coal hazards and for reducing unsafe practices in the various departments of the cement industry were the chief points discussed by representatives of the cement companies at the sectional meetings of the twelfth annual congress of the National Safety Council at the Statler hotel, Buffalo, N. Y., October 3 and 4.

Safety from the Executives' Standpoint

One of the interesting matters brought out at the meetings was how executives of cement companies look upon the safety campaign. Their viewpoint was presented by Colonel E. M. Young, vice president of the Lehigh Portland Cement Co., Allentown, Pa., and treasurer of the Portland Cement Association.

Colonel Young told the delegates, numbering close to 50, that executives regard safety as being fully as important as production and that they feel that production should not be placed ahead of human life and health under any conditions.

Safety is financially sound, he declared, it reduces insurance costs, creates a spirit of rivalry among the various departments and results in other benefits that go to increase efficiency. But the greatest factor, he added, is that it is a humanitarian movement.

"Executives regard safety as being just as valuable as a boiler house in the efficient operation of plants," was one of the phrases used by the speaker to emphasize the necessity for accident-prevention in cement plants.

In the discussion that followed the address by Colonel Young, stress was laid upon proper statistical information being placed before the executives and the point was made that absence of accidents goes hand in hand with a small labor turnover.

The Human Element

Much interest was shown by the delegates in the paper of H. H. Purkhiser, master mechanic, Lehigh Portland Cement Co., Mitchell, Ind., on "The Human Element—The Important Factor in Safety." The speaker, at the outset, explained that his remarks were based upon personal experiences at the Mitchell plant where between 500 and 700 men are employed.

Explaining that the company, after having reduced the number of unsafe places, requested the regular safety committee, consisting of the principal foreman and one or more additional men from the different departments, to report unsafe practices engaged in by workmen and "fool stunts" that were either observed or brought to their attention, Mr. Purkhiser said that then and there they began to reduce unsafe practices, for men are very sensitive regarding criticism of their own actions by their fellow workers and one important thing was being accomplished, that the workman was not only thinking about what he was doing but how he was doing it.

Interest of the different foremen, continued the speaker, was awakened by showing them records of accidents in their department for stated periods and explaining that the company expected to continue to classify them according to the foreman in charge and that their efficiency would be judged not only by the amount of work done but also by how safely they could do it.

This proved to be beneficial because not only did the foremen not want the worst records but because they would have to account to the safety committee in some satisfactory manner for the large number of accidents reported from their department. Competition aroused interest and good resulted.

The point was made by the speaker that safety depends mostly upon the foremen. They must themselves be sincere in every way and at all times, he said, make safety rules absolute and paramount and commend those who follow the rules even to the simplest degree.

Classification of accidents by departments led the way toward the adoption of several safety plans. It was discovered that some departments had gone for one year without a single time-lost accident and this furnished such an opportunity for interest and friendly rivalry that bulletins were posted showing the length of time departments went without mishaps.

Another plan, explained the speaker, was to list the causes from which the most common accidents occurred. The discovery was made that grinding wheels, cutting and chipping and small holes in the bottom of cement bags were the cause of most eye injuries. Goggles were then adopted and there has never been another accident from that source.

The menace of coal dust explosion, according to Mr. Purkhiser, outstanding as it is in many cement plants as the source of many serious accidents, has been entirely eliminated in this respect at the Mitchell mills, due wholly to close observance of safety rules as to the handling of fire in the department.

Such interest in the safety program has been aroused in the Mitchell mills, that nearly every man is unconsciously a watchdog for unsafe practices. In this connection Mr. Purkhiser pointed out the necessity for never permitting the no-accident campaign to let up. He recommended adoption of a school plan for holding regular classes for safety instruction. He suggested that 30 or 40 men meet once a week and that at such classes, the history of safety work in the mills be reviewed and the point that carelessness is unjustifiable be driven home.

"I like to think of our safety meetings," continued the speaker, "as a dynamo which is continually generating safety current to every man in the mill, which keeps them active and alert at all times and for that reason we have never postponed or cancelled a single meeting in several years.

"The question may arise, how do you keep up interest? My reply to that would be that as long as the mill continues to make records which are worthwhile, it attracts not only the attention and interest of the men employed but also of the entire community and men usually like to have a part in doing things worth while."

Frank Wanzer, safety inspector, Steel Company of Canada, Ltd., Montreal, Que., opened the discussion by asking for comment on a scheme with which he is experimenting. This calls for picking out two of 25 men to report daily for one month or longer some unsafe practice that they have seen, such as the dropping of a hammer, along general safety and fire prevention lines. They turn in written reports to the foreman. He delivers them to the superintendent who, in turn, places them in the hands of the works manager. The plan is to make the men observant and thoughtful.

The general discussion that followed made it clear that the sense of the gathering was that this scheme was too complicated for good practice and that a better plan would be to have the superintendent develop personal contact with the workmen and the foremen.

A. C. Tagge, vice president and general manager of the Canada Cement Co., explained that while Mr. Wanzer should be commended for striving to obtain a systematic method, he believes it more beneficial to have personal contact in preference to written reports.

H. G. Jacobson, manager, Bureau of Accident Prevention and Insurance, Portland Cement Association, Chicago, Ill., became ill after reaching Buffalo and was unable to attend the meetings. His paper was read by the chairman.

Powdered Coal Hazards

Mr. Jacobson's paper contained a resumé of the progress that has been made toward eliminating the powdered coal hazards in the cement business and stated that constant improvements in the industry have cut down the dangers of this nature.

In response to a request from the chairman that delegates state what methods they employ to eliminate coal dust hazards, several of those in attendance took the floor.

John Ball, superintendent of the West Copley plant, Allentown, Pa., declared that the best method is to get rid of carelessness and that this can be effected only by giving the bosses and the workmen a square deal and by gaining their confidence.

Mr. Purkhiser urged constant watchfulness and care to prevent accumulation of dust as being the only effective method. He said that at Mitchell, the mill is shut down at the same hour every day, dryers are closed so that there is no open flame and then the roof is blown and the house is swept free of all material that accumulates during the day.

Owen Hess, superintendent of the Dexter Portland Cement Co., Nazareth, Pa., advocated putting dryers outside the coal house. He said that the coal house must be kept open so that there is no danger of explosion as the dust has free exit.

One of the delegates suggested that unless some action is taken when workmen submit proposals for increasing safety in cement mills they soon would lose interest in safety work. Several others responded that, even though the proposal was not adopted, letters from mill officials are invariably sent to the workman expressing their appreciation for his interest in accident prevention.

Officers of the cement section were re-elected as follows: Henry A. Reninger, special representative, Lehigh Portland Cement Co., Allentown, Pa., chairman and H. G. Jacobson, manager, Bureau of Accident Prevention and Insurance, Portland Cement Association, Chicago, Ill., secretary.

Kansas Cement Companies Found Not Guilty

The jury sitting in the Reno county, Kansas, case involving the Ash Grove Lime and Portland Cement Co. and other Kansas cement manufacturers was instructed on Oct. 9, by Judge W. G. Fairchilds to return a verdict of not guilty.

The instructions of the court were given after an argument by C. W. Taylor, special prosecutor who was assisting County Attorney Harry F. Brown. During the debate Senator Taylor announced the State would rest, and Judge Fairchilds instructed the jury as to the verdict, without any testimony whatever having been adduced by the defendants.

The dismissal of these cases against the cement corporations clears the docket of all Anti-Trust cases brought within the state of Kansas against Kansas cement companies, growing out of a grand jury's investigation in the spring and summer of 1921, in which the cement corporations were charged with unlawful combination.

At the close of the trial it was found that the State's case was not in line with the information based on a grand jury indictment two years ago. The State used several contractors and retail material men as witnesses but they seemed to know little regarding the alleged combination.

In July, 1919, the Attorney-General of Kansas brought "Quo Warranto" proceedings against the following Kansas cement companies: the Ash Grove Lime & Portland Cement Co., the Bonner Portland Cement Co., The Fredonia Portland Cement Co., the Great Western Portland Cement Co., the Monarch Cement Co., the Lehigh Portland Cement Co., the Western States Portland Cement Co.

There was no substantial basis for such a suit and it dragged along for more than three years, but was kept alive apparently to satisfy a made-to-order public clamor.

The Reno county indictments were an outgrowth of the State proceedings, and it was disclosed at the trial that the indictment had been drawn by the Attorney-General or under his direction.

On September 5th, 1922, the State's case was settled by stipulation and agreement between the parties which contains the following provision, to-wit:

"Nothing in this stipulation, nor in the judgment and decree, shall ever be taken or held either as a judgment of guilt or as an admission on the part of the defendants that they have violated any of the anti-trust laws of the State of Kansas, or that they have agreed by and among each other, or any of them, to do or refrain from doing any of the matters or things set forth in the preceding paragraph thereof."

Cooperation in Revision of Cement Freight Rates

At a joint meeting of Central Freight Association carriers and companies with mills located in Central Freight Association, held in Chicago, September 17 on the revision of cement rates in the territory of Ohio, Indiana, Illinois, Michigan, Western New York and Pennsylvania, the cement companies agreed to cooperate with the railroads and figure the distances from their mills to points to which they desire rates published on the formula prescribed by the Interstate Commerce Commission in Atlas Portland Cement Co. vs. Chicago, Burlington & Quincy Ry. Co., et al, Docket No. 12710

Representatives of the Michigan, New Egyptian, Newaygo, Peerless, Petoskey, Peninsular and Wolverine Portland Cement Companies have been working with the Jackson Traffic Bureau, Jackson, Mich., figuring the distances from Four Mile Lake, Port Huron, Egypt, Union City, Newaygo, Cement City, Lamson, Coldwater and Quincy.

A Correction

In a recent issue there appeared an advertisement by the Celite Products Co. on Sil-O-Cel heat insulation in which the statement was made that Sil-O-Cel insulating brick possessed a crushing strength of more than 400 lbs. per square foot. Sil-O-Cel insulating brick possesses a much greater crushing strength and the statement should have read "400 lbs. per square *inch*," the equivalent of about 28 tons per square foot.

Cement Production in 1922

By Robert W. Lesley

Past President of the Portland Cement Association

Reprinted from *Mineral Industry*.

The production of portland cement in the United States in 1922 reached the enormous total of approximately 115,000,000 bbl., the largest output that this or any other country has ever known. The exact figures reported fix the total at 114,789,984 bbl., as against 98,842,049 bbl. in 1921. This was more than a barrel for every inhabitant of the United States. There was actually consumed 1.06 bbl. per capita. The predictions made in the fall of 1921 concerning the necessity for increased housing and other construction held back by the war were verified in the enormous growth in the demands for building in all forms. All this found its echo in the production and consumption of portland cement, as shown by the accompanying tables.

Production in 1922 exceeded that of 1921 by almost 16,000,000 bbl., a gain of 16%. This gain in a single year would exceed the entire production of portland cement from the beginning of the industry in the early seventies up to 1899, a period of nearly 30 years. A further significant fact is that shipments of cement exceeded production, reaching approximately 118,000,000 bbl. Shipments represent consumption, and this means that the country has been engaged extensively in building construction of sundry types with the most enduring of structural materials. A vast deal of this cement has gone into durable highways, and large quantities into fire-resisting buildings. Consumption has represented myriads of undertakings of public and private nature, these covering uses that are now numbered by the hundreds in contrast to the situation not very many years ago, when the uses of cement could be easily enumerated.

The per-capita figures are interesting as showing the demand for cement during the war, a falling-off in demand during what may be termed the reconstruction period, and immediate increase with industry and commerce more stabilized. The per-capita figures from 1914 to 1922 are as follows:

Year	Barrels	Year.	Barrels
1914	0.77	1919	0.77
1915	0.83	1920	0.86
1916	0.89	1921	0.87
1917	0.84	1922	1.06
1918	0.64		

America still finds restricted use for natural cement, which is acceptable for brickwork and certain types of masonry construction. The following table of shipments of all cements shows how largely natural cement has been superseded by portland cement:

Table 1.—Principal Hydraulic Cements Shipped from Factories in the United States(a)

Class	1920		1921		1922	
	Quantity (Barrels)	Value	Quantity (Barrels)	Value	Quantity (Barrels)	Value
Portland	96,311,719	$194,439,025	95,507,147	$180,778,415	117,701,216	$207,170,430
Masonry natural	— 767,481	1,150,890	539,402	897,025	889,428	1,293,598
Puzzolan	—					
Total	97,079,200	$195,589,915	96,046,549	$181,675,440	118,590,644	$208,464,028

(a)U. S. Geological Survey

While the great increase in production and shipments of cement may be interpreted as of inportant material advantage to the nation as a consumer, the price realized by the manufacturer shows a decrease. The average factory price per barrel in 1921 was $1.89 as against $1.76 in 1922. That this decline in price should have taken place in the face of protracted coal and railroad strikes which occurred during the year is a tribute to economical management of plants on the part of manufacturers.

The following table gives average factory prices from the beginning of the industry to 1922:

Table 2.—Average Price per Barrel of Portland Cement, 1870-1922

Year	Price	Year	Price	Year	Price
1870–1880	$3.00	1897	$1.61	1911	$0.844
1881	2.50	1898	1.62	1912	0.813
1882	2.01	1899	1.43	1913	1.005
1883	2.15	1900	1.09	1914	0.927
1884	2.10	1901	0.99	1915	0.860
1885–1888	1.95	1902	1.21	1916	1.103
1889	1.67	1903	1.24	1917	1.354
1890	2.09	1904	0.88	1918	1.598
1891	2.13	1905	0.94	1919	1.710
1892	2.11	1906	1.13	1920	2.020
1893	1.91	1907	1.11	1921	1.890
1894	1.73	1908	0.85	1922	1.760
1895	1.60	1909	0.813		
1896	1.57	1910	0.891		

Concerning manufacture by districts, it will be seen in Table 3 that the Lehigh district, which witnessed the founding of the industry, is still the largest manufacturing center, both as to active plants and production. While Maryland production statistics are now included with those of the Lehigh district, the latter alone greatly exceeds any other district in the United States in the matter of production. In percentage of increase, however, this region took third place in 1922, being surpassed by Texas and the district comprising Kansas and Oklahoma.

While experiment and research on the subject of fuel economy continue, coal maintains its prestige as a fuel. Next to coal is crude oil, with 17 plants using it in 1922 as against 90 using coal. Table 5 gives status of the several kiln fuels now in use.

Table 5.—Statistics Showing Fuel Used in Burning Portland Cement (a)

Fuel	1921				1922			
	Number of Plants	Number of Kilns	Barrels	Percentage of Total	Number of Plants	Number of Kilns	Barrels of Cement	Percentage of Total
Coal	92	607	80,557,675	81.5	90	590	86,864,274	75.7
Coal and oil	3	31	5,536,128	5.6	7	64	12,030,542	10.5
Coal and gas	1	6			1	6		
Oil	16	81	10,123,781	10.2	17	85	12,794,890	11.1
Coal, oil and gas	2	9	2,624,465	2.7	2	8	3,100,278	2.7
Natural gas	1	6			1	7		
Total	115	740	98,842,049	100.0	118	760	114,789,984	100.0

(a)U. S. Geological Survey

It will be noted that imports of cement continue, though so restricted as to be almost negligible compared with domestic production. They show the same fluctuating tendency that has marked importations since 1900. The following table gives imports of foreign cement since 1887:

Table 6.—Imports of Foreign Cement, in Barrels of 380 lb.(a)

1887	1,514,095	1899	2,108,388	1911	164,670
1888	1,835,504	1900	2,386,683	1912	68,503
1889	1,740,356	1901	939,330	1913	85,470
1890	1,940,186	1902	1,963,023	1914	120,906
1891	2,988,313	1903	2,251,969	1915	42,218
1892	2,440,654	1904	968,409	1916	1,836
1893	2,674,149	1905	896,845	1917	2,323
1894	2,638,107	1906	2,273,493	1918	305
1895	2,997,395	1907	2,033,438	1919	8,931
1896	2,989,597	1908	842,121	1920	524,604
1897	2,090,924	1909	443,888	1921	122,322
1898	1,152,861	1910	306,863	1922	323,823

(a)After 1920, barrels of 376 lb.

In the matter of exports, the year 1922 shows a slight decline over 1921. Exports from 1904 to 1922 are given in the following table:

Table 7.—Exports of Cement, in Barrels

Year	Quantity	Value	Percentage of Total	Year	Quantity	Value	Percentage of Total
1906	583,299	$ 944,886	1.1	1915	2,565,031	$3,361,451	2.9
1907	900,550	1,450,841	1.7	1916	2,563,976	3,828,231	2.7
1908	846,528	1,249,229	1.6	1917	2,586,215	5,328,536	2.8
1909	1,056,922	1,417,534	1.6	1918	2,252,446	5,912,166	3.2
1910	2,475,957	3,477,981	3.2	1919	2,463,573	7,513,389	2.9
1911	3,135,409	4,632,215	3.9	1920	2,985,807	10,045,369	3.1
1912	4,215,532	6,160,341	5.1	1921	1,181,014	4,276,986	1.2
1913	2,964,358	4,270,666	3.3	1922	1,127,845	3,206,201	1.0
1914	2,140,197	3,088,809	2.5				

Increase in the use of American portland cement by outlying possessions of the United States is shown by

TABLE 3.—PORTLAND CEMENT PRODUCED AND IN STOCK IN THE UNITED STATES, BY DISTRICTS AND STATES (a)

Commercial District.	Production.					Stock.		
	Active Plants.		Quantity (Barrels).		Percentage of Change.	Quantity (Barrels).		Percentage of Change.
	1921.	1922.	1921.	1922.		1921 (Revised).	1922.	
Eastern Pennsylvania, New Jersey, and Maryland	22	22	25,571,726	31,195,617	+22	2,998,155	2,294,497	−23
New York	8	9	5,294,188	5,922,706	+12	784,607	516,365	−34
Ohio, western Pennsylvania, and West Virginia	10	10	9,501,895	10,753,301	+13	1,151,043	862,361	−25
Michigan	11	12	5,777,533	6,243,805	+ 8	759,703	641,432	−16
Illinois, Indiana, and Kentucky	10	10	17,050,741	17,998,914	+ 6	2,102,438	1,424,696	−32
Virginia, Tennessee, Alabama, and Georgia	7	8	5,065,854	5,954,043	+18	374,105	169,506	−55
Eastern Missouri, Iowa, and Minnesota	9	9	9,951,283	11,392,552	+15	1,717,321	1,452,387	−15
Western Missouri, Nebraska, Kansas, and Oklahoma	11	11	6,351,747	8,025,720	+26	877,640	936,118	+ 7
Texas	5	5	2,668,741	3,628,756	+36	296,296	190,762	−36
Colorado and Utah	5	5	1,860,573	2,020,784	+ 9	215,579	172,857	−20
California	9	9	7,302,784	8,711,515	+19	564,713	235,441	−58
Oregon, Washington, and Montana	8	9	2,444,984	2,942,271	+20	350,967	370,816	+ 6
	115	118	98,842,049	114,789,984	+16	12,192,567	9,267,238	−24
Alabama	3	3	1,743,287	2,290,884	+31	68,638	35,406	−48
California	9	9	7,302,784	8,711,515	+19	564,713	235,441	−58
Illinois	4	4	5,587,825	6,407,129	+15	772,955	625,139	−19
Iowa	4	4	4,590,920	4,272,432	− 7	993,090	790,447	−20
Kansas	7	7	3,781,494	4,634,287	+23	540,877	618,647	+14
Michigan	11	12	5,777,533	6,243,805	+ 8	759,703	641,432	−16
Missouri	5	5	4,446,091	6,170,633	+39	640,932	572,444	−11
New York	8	9	5,294,188	5,922,706	+12	784,607	516,365	−34
Ohio	5	5	2,563,773	2,835,243	+11	238,678	161,797	−32
Pennsylvania	22	22	27,628,598	33,276,093	+20	3,410,698	2,659,452	−22
Texas	5	5	2,668,741	3,628,756	+36	296,296	190,762	−36
Washington	4	4	1,678,863	1,942,781	+16	255,293	246,660	− 3
Other states (b)	28	29	25,777,952	28,453,720	+10	2,866,087	1,973,246	−31
	115	118	98,842,049	114,789,984	+16	12,192,567	9,267,238	−24

(a) U. S. Geol. Surv. (b) Colorado, Georgia, Indiana, Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, Tennessee, Utah, Virginia, and West Virginia.

TABLE 4.—PORTLAND CEMENT SHIPPED IN THE UNITED STATES, BY DISTRICTS AND STATES (a)

Commercial District.	Shipments.					Average Factory Price Per Barrel.	
	1921.		1922.		Percentage of Change in Quantity.		
	Quantity (Barrels).	Value.	Quantity (Barrels).	Value.		1921.	1922.
Eastern Pennsylvania, New Jersey, and Maryland	24,841,973	$44,110,573	31,897,649	$51,953,144	+28	$1.78	$1.63
New York	4,993,341	9,403,015	6,194,663	10,694,426	+24	1.88	1.73
Ohio, western Pennsylvania, and West Virginia	9,185,858	15,947,184	11,040,908	18,586,754	+20	1.74	1.68
Michigan	5,680,156	10,300,289	6,349,751	11,145,573	+12	1.81	1.76
Illinois, Indiana, and Kentucky	16,423,356	28,468,092	18,676,656	30,159,728	+14	1.73	1.61
Virginia, Tennessee, Alabama, and Georgia	4,916,245	9,879,466	6,158,652	10,854,347	+25	2.01	1.76
Eastern Missouri, Iowa, and Minnesota	9,432,573	16,805,272	11,657,484	19,528,016	+24	1.78	1.68
Western Missouri, Nebraska, Kansas, and Oklahoma	6,100,391	12,503,617	7,967,266	14,570,823	+31	2.05	1.83
Texas	2,514,045	5,902,863	3,730,477	7,515,932	+48	2.35	2.01
Colorado and Utah	1,806,931	4,330,333	2,063,500	4,609,605	+14	2.40	2.23
California	7,180,700	16,856,258	9,041,788	20,478,577	+26	2.35	2.26
Oregon, Washington, and Montana	2,431,578	6,271,453	2,922,422	7,073,505	+20	2.58	2.42
	95,507,147	$180,778,415	117,701,216	$207,170,430	+23	$1.89	$1.76
Alabama	1,714,286	$3,466,223	2,324,116	$4,135,684	+36	$2.02	$1.78
California	7,180,700	16,856,258	9,041,788	20,478,577	+26	2.35	2.26
Illinois	5,237,510	9,092,982	6,554,945	10,584,171	+25	1.74	1.61
Iowa	4,151,439	7,439,983	4,475,074	7,709,313	+ 8	1.79	1.72
Kansas	3,643,582	7,253,944	4,556,517	8.138,268	+25	1.99	1.79
Michigan	5,680,156	10,300,289	6,349,751	11,145,573	+12	1.81	1.76
Missouri	4,375,712	8,034,540	6,239,144	10,457,557	+43	1.84	1.68
New York	4,993,341	9,403,015	6,194,663	10,694,426	+24	1.88	1.73
Ohio	2,518,723	4,615,492	2,913,034	5,243,687	+16	1.83	1.80
Pennsylvania	26,622,367	46,881,625	34,023,695	55,528,002	+28	1.76	1.63
Texas	2,514,045	5,902,863	3,730,477	7,515,932	+48	2.35	2.01
Washington	1,612,891	4,080,785	1,951,414	4,684,624	+21	2.53	2.40
Other states (b)	25,262,395	47,450,416	29,346,598	50,854,616	+16	1.88	1.73
	95,507,147	$180,778,415	117,701,216	$207,170,430	+23	$1.89	$1.76

(a) U. S. Geol. Surv. (b) Colorado, Georgia, Indiana. Kentucky, Maryland, Minnesota, Montana, Nebraska, New Jersey, Oklahoma, Oregon, Tennessee, Utah, Virginia, and West Virginia.

the following table of exports to Alaska, Hawaii, and porto Rico. In 1922 Alaska used double the quantity shipped there in 1921.

TABLE 8.—DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, PORTO RICO, IN 1921 AND 1922

	1921		1922	
	Barrels	Value	Barrels	Value
Alaska	10,015	$41,239	20,345	$74,950
Hawaii	170,579	574,946	201,353	609,330
Porto Rico	116,082	395,046	125,418	323,338
	296,676	1,011,231	347,116	1,007,618

SCIENTIFIC DEVELOPMENT

The Joint Committee on Concrete and Reinforced Concrete succeeded during the year in putting in form requirements for a tentative specification for concrete. This was submitted to the various scientific organizations represented on the committee and is expected to be presented in final form during the fall of 1923. Growing out of the work of the Joint Committee were the tests at the Victor plant in Camden, N. J., on the field control of concrete, as outlined in the committee's work. This important investigation is expected to lead to most valuable data in connection with the actual requirements of concrete in the field.

During the year the Portland Cement Association celebrated the twentieth anniversary of its existence, and this event led to the preparation of many interesting papers showing the growth of the industry in this country and its development, both in the field of commerce and science. Many valuable experiments in road tests were carried on during the year, most notably those known as the Bates' road tests, at Springfield, Mo., and the California tests conducted in that State.

As a development of the greater study of concrete, much progress has been made during the year in the matter of precasting concrete units for various purposes. In addition to concrete piles, which have been very successfully made, important developments have occurred in the manufacture of telegraph poles, reinforced-concrete railway ties, and various types of building units; and there is hope that in the future a considerable amount of concrete used in building construction may find its way to the works in its final and completed form.

Many interesting data have been gathered by experiments at Columbia University and in the Bureau of Standards in connection with the use of cement bricks in walls and columns. The growth of the small concrete house under architectural and scientific supervision has gone on through all parts of the country.

While the American Society for Testing Materials, through its committees on fireproofing, concrete and concrete aggregates, and cement, added much to the knowledge on these various subjects during the year, the Portland Cement Association, through its laboratory in connection with the Lewis Institute of Chicago, and also through its Conservation Committee, made great progress, not only in the field of the uses of cement and concrete, but also in more successful and economical methods of manufacture of portland cement.

The strike of the railway shopmen and the consequent delays in transportation, coupled with the strike of the coal miners practically in all parts of the country, marked the cement season of 1922 and made it one of great difficulty to manufacturer and consumer. Owing to the conditions prevalent, great delays in shipments were noted in all parts of the country. Cars were scarce and service intermittent, so that production had to be suspended on account of coal shortage. As a result of this last condition, which made a deep impression upon the manufacturer, great study of fuel economy has gone on in scientific circles in the industry; and while the coal strike of 1922 may be referred to as having caused a great loss to the manufacturer, there is a possibility that out of the bitter experience gained there will come new methods and new ways of handling the fuel problem, and a greater service and economy to the producer.

CEMENT ACTIVITIES IN FOREIGN FIELDS

EUROPE

France.—Recent figures give the French production of cement at 4,633,150 metric tons per annum. Of this, 2,958,500 tons is artificial Portland, 758,400 tons natural cement, and 472,600 tons slag cement.

Business for 1922 was prosperous, and considerable cement was shipped from France to Great Britain, Ireland, and Holland. The restoration of the devastated region also afforded the French cement manufacturers an additional large market.

Belgium.—Practically all the cement made in Belgium is portland, and the output, which was about 1,500,000 tons before the war, is gradually getting back to normal. The 1921 output was close to 700,000 tons, while the first nine months of 1922 yielded 620,766 tons.

Attempts were made to consolidate a number of the works but proved a failure, and the cartel agreement between Belgium works and certain German syndicates, which were reorganized after the war, was dissolved in January, 1922.

Of late Belgium is exporting to all parts of the world and regaining her footing in the international markets.

England.—The English cement industry has met with considerable difficulty since the war, due to the high prices for both coal and labor, and also the importation of cement from France, Norway, and Belgium, which has in a minor degree interfered with her own market. Production and shipments have by no means reached pre-war conditions, and in many of the plants operations are on a basis of about 50 per cent. of capacity.

The new specifications for portland cement which were recently put into effect are being well received and met by manufacturers.

Germany.—While as a general proposition it may be stated that a return to pre-war conditions is still far off, in one district, that of Westphalia, pre-war production has been reached. Generally, however, business has fallen off, and export fees and taxes have largely reduced the foreign shipments.

At the end of 1922 the price for coal in marks was 2000 times that of 1914, while for cement the price was only 1100 times, and wages were about 1000 times those of 1914.

Germany has had to import a large amount of coal to keep her cement industry going, and owing to the lack of fuel 30 plants have closed down, while the rest have reduced their output by 40%, thus greatly hampering building activity requiring cement.

Czecho-Slovakia.—The yearly capacity of the cement works is stated to be about 80,000 to 90,000 carloads. Many plants have been rebuilt since the war, and in some sections considerable slag cement is also made. The yearly peace-time consumption of the Czecho-Slovakian portland cement industry is estimated at from 50,000 to 60,000 carloads, or 500,000 to 600,000 tons.

Poland.—The last figures obtainable indicate a capacity in Poland and Galicia of close to 1,000,000 tons per annum, with an output for 1921 of 275,000 tons.

Roumania.—Rebuilding of old cement works at Torda is progressing. Roumania now has 12 cement works in operation, with a daily output of 1300 tons, or about 40,000 cars of 10 tons a year.

NORTH AMERICA

Canada.—The sales of cement in Canada during 1922 increased by about 1,000,000 bbl. over the record for the previous year. The figures were 6,943,968 bbl. in 1922 as against 5,752,885 bbl. in 1921. During the period under review no puzzolan cement was produced while in 1921 the sales were some 4,761 bbl.

The principal producing Provinces were Ontario and Quebec, the sales of cement from the former Province being valued at approximately $6,394,000, while the cement from mills in Quebec amounted to almost $5,908,000. The cement manufactured in the Province of Quebec amounted to 2,660,935 bbl., while Ontario produced 3,104,382 bbl.

Exports of cement in 1922 amounted to 1,487,981 cwt., equivalent to 425,137 bbl. of 350 lb. each, valued at $699,738, as against 848,208 cwt., the equivalent of 242,345 bbl. valued at $650,658 in 1921.

The imports of cement and manufacturers of cement during the year amounted to $96,310 as against $82,615 in 1921.

Cuba.—In face of the fact that Cuba has a very successful local cement plant, she imported from the United States some 443,000 bbl. in 1922, while the local plant manufactured 435,000 bbl. European exporters have not been so successful in this market on account of the lower rate of duty levied on American imports.

Panama.—Recent figures show that Swedish and continental cements are driving the American product out of this market.

Mexico.—Two new cement companies are projected in Mexico.

SOUTH AMERICA

Argentine.—The local company, Argentina de Cementos, has been a large producer of late years and finds a ready market for all its products. English cement has been practically excluded from Argentine markets by reason of the freights from Scandinavia, Belgium, and Germany being much lower than those ruling from Britain, the freight from the continental countries above named being about half of that from Great Britain to the same port.

Brazil.—Brazil still continues as a large importer of portland cement. Recently United States manufacturers have found that they cannot compete with the low prices and low freights made by European producers. One of the most important contractors, however, is using American portland-cement clinker, which is shipped from this country in its unmanufactured state and ground in a special grinding plant put up on the site of the large public works where the cement is to be ultimately used.

ASIA

China.—China has five plants, and the production of portland cement has been considerably increased within the last two years. The estimated daily capacity in barrels of 375 lb. is 7,350, or a total annual production for all plants of 2,682,750 bbl. China still imports a considerable amount of cement, but her exports have fallen off largely in recent years.

A new cement works is projected in the Yangtze Valley.

Taking the population at 440,000,000 and comparing the per-capita consumption of cement with that of the United States, China would use nearly 220 times as much cement as at present, if her per-capita consumption reached that of this country.

Japan.—Japan has 21 operating cement companies which have a capacity of 500 bbl. or more daily. Three of these have a capacity in excess of 1000 bbl. daily. The cement consumed locally in Japan is used almost entirely by Japanese with Japanese capital, and the cement plants are practically all owned by Japanese, who have visited cement mills in all parts of the world to accumulate the experience with which they have so successfully established the industry in Japan.

A consolidation of a number of the large companies has been made, the principal purpose being to increase export by fighting competition.

India.—India has five cement works in operation, the largest having a monthly capacity of 50,000 bbl., the total monthly output being close to 100,000 bbl. Several new plants are projected in this country, where the low cost of labor and fuel are quite a factor to promoters.

A new cement plant is proposed on the island of Jaffna at the northern extremity of Ceylon.

AUSTRALIA

New works are planned on Maria Island in the eastern part of Tasmania, with a capacity of 40,000 tons a year.

New South Wales is to have a new cement plant with a capacity of 30,000 tons a year at Cockle Creek.

AFRICA

Egypt.—Since the war the demand for cement in Egypt has largely increased and while importations are very extensive, the local works at Nassara has found an outlet for its entire production of about 30,000 tons a year. Before the war Belgium occupied first place in the Egyptian cement market and England second.

Mozambique.—The cement works at Mozambique will have a plant in operation within a short period, on a basis of 40,000 tons per annum.

South Africa.—The four factories in the Union of South Africa have a capacity of 2,125,000 bbl. a year. Three of these plants are controlled by the Pretoria Portland Cement Co., with head offices in Johannesburg, and the fourth company is a branch of the White Cement Co. of England.

New Books

Standard Methods of Chemical Analysis, Wilfred W. Scott, Size 6 in. x 9 in.; 1568 pages; illustrated; Price, $10.00 for two volumes (not sold separately); D. Van Nostrand Co., New York city.

This is a manual of analytical methods and general reference for the analytical chemist and for the advanced student. A third edition is thoroughly revised and greatly enlarged.

This book is a compilation of carefully selected methods of technical analyses that have proved of practical value to the professional chemist. The subjects have been presented with sufficient detail to enable one with an elementary knowledge of analytical processes to follow the directions.

Each chapter on the elements is generally arranged according to the following outline: physical properties, detection, estimation, preparation and solution of samples, separation, methods.

The last portion of the book is devoted to tables of the more important arithmetical operations, designed to assist the analyst to greater accuracy of calculation as well as to relieve him of needless expenditure of time and energy.

Portland Cement Output in September 1923

The statistics shown in the following tables issued by the Department of the Interior, and prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on reports of producers of portland cement but in part on estimates. The estimates for September, 1923, were made necessary by the lack of returns from one plant. September production is the highest for any month, but shipments, although higher than one year ago, were exceeded in certain months in 1922 and 1923. Stocks are higher than in September, 1922.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT BY DISTRICTS IN SEPTEMBER, 1922 AND 1923, AND STOCKS IN AUGUST, 1923, IN BARRELS

Commercial District	Production September		Shipments September		Stocks at end of September		Stocks at end of August, 1923a
	1922	1923	1922	1923	1922a	1923	
Eastern Pa.N.J. & Md.	3,124,000	3,293,000	3,431,000	3,780,000	1,153,000	1,630,000	2,118,000
New York	643,000	726,000	791,000	788,000	370,000	490,000	552,000
Ohio Western Pa. & W.Va.	1,172,000	1,327,000	1,435,000	1,495,000	416,000	301,000	469,000
Mich.	656,000	876,000	667,000	838,000	155,000	223,000	185,000
Ill., Ind. & Ky.	1,659,000	1,893,000	1,706,000	1,927,000	649,000	395,000	428,000
Va. Tenn. Ala.& Ga.	468,000	779,000	482,000	731,000	292,000	279,000	231,000
Eastern Mo.,Ia., & Minn.	1,124,000	1,367,000	1,282,000	1,408,000	328,000	621,000	662,000
Western Mo.Neb. Kan. & Okla.	864,000	1,009,000	930,000	1,001,000	630,000	653,000	645,000
Texas	365,000	367,000	330,000	305,000	152,000	220,000	159,000
Colo. & Utah	230,000	293,000	225,000	244,000	179,000	163,000	113,000
Calif.	776,000	909,000	783,000	874,000	209,000	256,000	220,000
Ore., Wash. & Mont.	343,000	270,000	382,000	307,000	191,000	261,000	298,000
	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	5,492,000	6,080,000

(a) Revised.

Stocks of clinker, or unground cement, at the mills at the end of September, 1923, amounted to about 3,379,000 barrels compared with 3,759,000 barrels (revised) at the beginning of the month.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT BY MONTHS IN 1922 AND 1923, IN BARRELS

Month	Production		Shipments		Stocks at end of month	
	1922	1923	1922	1923	1922a	1923
January	a 4,291,000	7,704,000	a2,931,000	5,419,000	13,316,000	a11,470,000
February	4,278,000	8,085,000	3,285,000	5,963,000	14,142,000	a13,502,000
March	6,685,000	9,880,000	7,002,000	10,326,000	13,848,000	a13,045,000
1st quarter	15,254,000	25,669,000	13,218,000	21,708,000	....	....
April	9,243,000	11,359,000	8,592,000	12,954,000	14,470,000	a11,463,000
May	11,176,000	12,910,000	12,749,000	14,257,000	12,893,000	a10,144,000
June	11,245,000	12,382,000	13,470,000	13,307,000	10,718,000	a 9,168,000
2nd quarter	31,664,000	36,651,000	34,811,000	40,518,000	....	....
July	11,557,000	12,620,000	13,850,000	13,712,000	8,433,000	a 8,081,000
August	11,664,000	12,967,000	14,361,000	14,971,000	5,746,000	a 6,080,000
September	11,424,000	13,109,000	12,444,000	13,698,000	4,724,000	5,492,000
3rd quarter	34,645,000	38,696,000	40,655,000	42,381,000	....	....
October	12,287,000	....	12,854,000	....	4,149,000	....
November	11,349,000	....	10,167,000	....	5,320,000	....
December	8,671,000	....	4,858,000	....	9,267,000	....
4th quarter	32,307,000	....	27,879,000	....	....	....
Preliminary total	113,870,000	....	116,563,000	....	....	....
Amount of under estimate.	919,984	....	1,138,216	....	....	....
Final total	114,789,984	....	117,701,216	....	....	....

(a) Revised.

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1922 AND 1923, IN BARRELS (a)

Month	Imports		Exports	
	1922	1923	1922	1923
January	17,039	71,686	70,725	73,169
February	5,157	20,529	82,421	88,624
March	1,597	66,521	103,556	98,861
April	10,855	76,416	75,412	85,662
May	2,524	88,480	100,068	103,634
June	14,198	111,559	96,263	77,203
July	957	286,106	119,491	82,774
August	56,757	323,948	105,156	73,201
September	(c) 42,641	(b)	78,615	(b)
October	(d) 65,228	....	80,402	....
November	61,010	....	108,798	....
December	45,860	....	106,938	
	323,823	....	1,127,845	

(a)Compiled from records of the Bureau of Foreign and Domestic Commerce. (b)Imports and exports in September, 1923 not available. (c)Covers period Sept. 1-21. Imports Sept. 22-30 included with Oct. (d)Includes imports period Sept. 22-30.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in August, 1923, amounted to 323,948 barrels, valued at $562,688. The total imports in 1922 amounted to 323,823 barrels, valued at $628,846. The imports in August were from Norway, 80,914 barrels; England, 71,954 barrels; Denmark, 56,149 barrels; Sweden, 51,949 barrels; Quebec Province, Canada, 46,319 barrels; Belgium, 12,427 barrels; Germany, 4,063 barrels; other countries, 173 barrels. The imports were received in the following districts: Los Angeles, 121,681 barrels; Florida, 33,314 barrels; Oregon, 32,808 barrels; Porto Rico, 29,906 barrels; North Carolina, 26,213 barrels; Buffalo, 21,441 barrels; Vermont, 14,816 barrels; San Francisco, 11,569 barrels; St. Lawrence, 8,817 barrels; other districts,23,383 barrels.

The exports of hydraulic cement in August, 1923, were 73,201 barrels, valued at $219,072, of which was sent to Cuba, 39,197 barrels; to the other West Indies, 4,145 barrels; South America, 13,538 barrels; Central America, 6,084 barrels; Mexico, 4,568 barrels; Canada, 1,606 barrels; and to other countries, 4,063 barrels.

The statistics of imports and exports of hydraulic cement in September, 1923, are not available.

Homer M. Hadley, district engineer in charge of the Portland Cement Association office at Seattle, sailed for Japan October 5 to make a thorough investigation of how modern structures, particularly those consisting largely of reinforced concrete, withstood the recent earthquake.

Mr. Hadley's trip will probably require three months or more absence from his official duties with the Portland Cement Association, although it is expected that very soon after his arrival in Japan he will be able to cable a condensed preliminary report that will reconcile a number of conflicting messages which have been sent out, leaving us thus far mostly in doubt as to just how modern structures in Japan withstood the earthquake.

Mason City, Iowa, industrial plants, including the Lehigh Portland Cement Co., Northwestern States Portland Cement Co., Mason City Brick & Tile Co., North Iowa Brick & Tile Co., and the National Clay Works have lodged a complaint with the Interstate Commerce Commission protesting against freight rates charged on bituminous coal to Mason City from Illinois and Indiana districts. The complainants represent that their aggregate consumption is 600,000 tons annually and that substantial reductions in the present freight rates are necessary to bring them down to a just and reasonable basis.

Locking Controller Prevents Accident

The explanation to a number of fatal or severe accidents has been "The machine was started unexpectedly." One of these cases is mentioned in the *Accident Prevention Bulletin* of the Portland Cement Association. An employe was standing in a screw conveyor box making repairs and someone not knowing this started the conveyor. This is a condition that should be given serious consideration and no effort should be spared to devise means whereby it will become impossible for anyone to become caught unexpectedly. Generally any machine is now started or stopped by the simple operation of moving the handle on an electric switch or compensator. Now, if a man who on account of the work to be done must place himself in a position that becomes extremely dangerous if machinery is set in motion without his knowledge, the first thing he should do in commencing the work ought to be that of fixing the machinery so that its starting is completely in his control.

A sign on the controller handle reading something like "Do Not Start—Man Working on Machinery" may impress the average man as being ample warning to anyone. It is not. There are cases on record where such a sign has been disregarded. It may sound impossible, but facts cannot be denied. Nor is it sufficient to put a timber or steel pipe in the motor as any such implement can be as easily removed as the sign. Locking the compensator is the only real safe and foolproof method. Each man is provided with a padlock and individual key. When he goes to work he places his padlock on the power controlling device and it stays there until he has finished his work and releases the machine. It may be that more than one man is engaged on the particular job or at some other place affected by the same controller. In this case there should be as many padlocks on the controller as there are men exposed. Not before the last padlock is removed, signifying that all men are out of danger, can the controller be operated.

A very important point is that each man must have his own padlock. It has been tried to have the foreman of the department lock and unlock the starter, but this method is far from foolproof because the men must depend on some second person for their safety. Like most good devices the locking gear is extremely simple to make and install. Any blacksmith can turn out a number of them in a short time and it requires only a few minutes to attach them. Then it is only a matter of furnishing the men with padlock and key.

Cement Research in England

The Report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1921-22 reveals the fact that large sums of money are being spent on research work in connection with building materials (especially portland cement) and methods of construction. The expenditure of the Building Research Board during the year under review was £10,323, and apparently the whole of this amount was derived from public funds. The amount of the Government grant to the British Portland Cement Research Association during a period of three years was £9,540, and the corresponding expenditure of the Association was probably double this sum because the funds of the Industrial Research Associations are made up of subscriptions from manufacturing firms in the industry and a Government grant of equal or less amount. The investigations by the Building Research Board, which has a Research Station at East Acton, include the experimental production of cement, the testing of firebricks, studies on the consistency of concrete, economy in brick burning, the use of corrugated asbestos-cement sheeting, etc. The results of some of the research work have been published from time to time, and it may be assumed that this course will continue to be adopted seeing that the work is being done with public money.

In the case of the British Portland Cement Research Association there has been no public issue of reports, and the results of investigations are communicated to the members of the Association alone. There is, of course, no alternative to this but publishing the results, whereby the whole of the world would reap the advantage of expenditure defrayed by a limited number of British manufacturers. The Privy Council Report, however, throws some light on the work of the Association and the benefits derived from it. Reports from four manufacturers are cited, each acknowledging indebtedness to the Association for its designs of mechanical apppliances connected with kilns and its assistance in connection with scientific management. In one case a saving in fuel worth £25,000 a year is mentioned, and in another case a saving of 300 to 400 tons of coal a year with a 10 per cent. increased output is also attributed to the research improvements. These savings must ultimately benefit the consumer of cement, if indeed they have not already had some bearing on the price reductions that have occurred, and the Government aid to the Portland Cement Research Association seems to have been well justified.—*Concrete and Constructional Engineering.*

Hearing on Magnesite Tariff Postponed

The Tariff Commission at the request of the Austro-American Magnesite Co. postponed from October 1 to December 5, a hearing in its investigation for tariff-making purposes of the differences in cost of production here and abroad of crude magnesite, caustic calcined magnesite, dead burned and grain magnesite, not suitable for manufacture into oxychloride cements, and magnesite brick. The investigation has been instituted to determine whether a change in the present duty is justified under authority vested in the President by Section 315 of the 1922 act.

Crude magnesite is subject at present to a specific duty of $\frac{5}{16}$c. per pound; caustic calcined magnesite, ⅝c. per pound; dead burned and grain magnesite, not suitable for manufacture into oxychloride cements, 23/40c. per pound; and magnesite brick, ¾c. per pound and 10% ad valorem. The hearing on December 5 will be held at the Tariff Commission's offices at Washington and will be public, interested parties being permitted to present whatever relevant testimony they desire.

The largest order for cement, 120,000 barrles, ever placed by the city of Los Angeles, Calif., was awarded by the Board of Public Works to three companies whose bids were the same, the California, Riverside and Southwestern Portland Cement Companies. The cement will be used in completing the new outfall sewer from Los Angeles to the sea.

The Viscosity of Raw Material Slurry

A laboratory method is given for calculating the amount by which the water content of a slurry can be reduced owing to the lowering of its viscosity by the addition of crude sodium carbonate, in a pamphlet compiled by J. W. Christelow and E. Bowes, issued by the British Portland Cement Research Association. The addition of 0.075% of crude sodium carbonate was found to give the maximum effect.

Cement manufacturers, it is stated, will appreciate fully the advantage of being able to reduce the proportion of water in slurry without increasing the difficulty of pumping or otherwise dealing with the slurry, but it will be a matter for individual experiment and calculation whether the saving of fuel obtained in this way is sufficient to pay for the sodium carbonate or other chemical used.

It is considered that the information given in the pamphlet from which the following is abstracted will enable the chemists of cement works to ascertain the effect of sodium carbonate or other chemicals upon any slurry submitted to them.

One important fact, of an unexpected nature, has resulted from carrying out the work. In those cases where the effect of sodium carbonate has been tried on the individual constituents of a slurry, it has acted upon the chalk and not upon the clay. In one case, the sodium carbonate actually had a stiffening effect upon the clay, thus neutralizing its action in thinning the chalk portion of the slurry. In another case, the use of chalk from a new quarry increased the amount of water which could be removed from that slurry by the addition of the 0.075% sodium carbonate from 1.5% to 4%.

In some cases the addition of 0.075% of sodium carbonate in the form of soda ash to slurry makes it possible to work with 4% less water, while in other cases only 0.6% water can be dispensed with by using the same amount. No means of increasing the action of sodium carbonate has been discovered, nor has a substitute been found that is more efficient than sodium carbonate.

Experiments were also conducted to determine the effect of time and temperature on a cement raw material slurry. The results of these experiments show that after a certain length of time, depending upon the viscosity of the slurry and during which the viscosity generally decreases, a continuous and pronounced increase of viscosity takes place until the cement slurry becomes too thick to flow. This is not due to separation of water, but is probably caused by flocculation or by thickening due to the presenec of colloidal matter in the slurry. The addition of sodium carbonate to the slurry tends to prevent this thickening.

The effect of various substances such as sodium silicate, sodium hydrate, sodium sulfate, sodium resinate, lime and barium salts, was also studied with the conclusion that none of these materials give better results than the sodium carbonate. From the study of the effect of an electric current on the viscosity of slurry, it is concluded, generally, that the passage of a direct current increases the viscosity of raw material slurry.

The following practical examples show the saving of coal consumption based on a rough estimate of the cost of carbonate and on the percentage reduction of water content of the slurry.

(1) A slurry originally containing 40% water can be worked with 36% water by an addition of 0.075% sodium carbonate.

The cost of sodium carbonate per 100 tons clinker is £1.76 from the preceding formula, assuming the price to be £10 per ton.

A reduction of 1% in the water of a slurry results in an average saving of 0.425 tons standard coal per 100 tons clinker. This figure is obtained from the work of the British Portland Cement Research Association on the thermal efficiency of the rotary kiln.

The reduction of water in the slurry from 40% to 36%, therefore, represents a saving of 1.7 tons of standard coal per 100 tons clinker.

The value of the coal saved, at £1.5 per ton delivered at the coal firing nozzle, is £2.55 per 100 tons clinker. The *economy* is therefore represented by *15/10d.* per 100 tons clinker.

(2) A slurry originally containing 40% water, can be worked with 37% water by an addition of 0.075% sodium carbonate.

Cost of sodium carbonate at £10 per ton (from formula) is £1.79 per 100 tons clinker. Value of coal saved is £1.91 per 100 tons clinker. *Economy* is represented by *2/5d.* per 100 tons clinker.

(3) A slurry originally containing 40% water can be worked with 38% water by an addition of 0.075% sodium carbonate. Cost of sodium carbonate at £10 per ton is £1.817 per 100 tons clinker. Value of coal saved is £1.275 per 100 tons clinker. A *loss* of *10/8d.* per 100 tons clinker results.

It is of course possible that the economy shown in two of the above calculations may not appear in practice owing to the possibility of part of the heat saved in evaporating water from the slurry serving merely to increase the temperature of the kiln exit gases. On the other hand there are certain possibilities which would favor the use of sodium carbonate supplied in the form of soda ash. For instance it is known that this material has a tendency to lower the clinkering temperature, and in some cases it has been added to the raw materials solely for this purpose.

With regard to the addition of soda ash to slurry it would seem better to introduce it in the form of a solution of suitable strength, rather than in the solid form, so as to ensure the constant addition of the correct quantity, and perfect mixing.

The labor involved in the handling of the soda ash has also to be taken into account in computing the value of any saving which may be expected.

Two Methods for Saving Cement Dust

The two principal methods of saving cement dust, are, according to a series of articles in *Tonindustrie-Zeitung* (Nos. 24, 45 and 63, 1923), the Cottrell-Moeller method as used in Brevik, Norway, built by the Lurgi-Apparatebau-Gesellschaft, and the Oski-Gesellschaft method, which is in successful use in several German cement plants.

Dr. Oppen states, that the Cottrell-Moeller plant at Brevik, Norway uses 20 K. W. for 2000 cu. meters gas per minute, while the Oski process uses only 11/0 part of this energy, and that the difference at 1c per k. w. hr. would amount to $5,000 per annum, and that as cement dust only is worth 1/7 of the value of cement, the former process is not as economical as the Oski method, with its far lower requirement of power, at any rate under conditions in Germany.

Dr. Fulda, of the Lauta factory, however points out, that Dr. Oppen does not mention the amount of dust which is precipitated, in comparing the two processes, and does not believe that the real economical difference anywhere reaches the amount stated, to which Dr. Oppen replies, that the amount of current by the Oski process is practically independent of the amount of dust gathered, and that at 20 k. w. per hour, at Brevik, 625 kg. is deposited, while the Oski process deposits 2,000 kg.

Application of Anti-Dumping Act to Cement Asked

Importation into the United States of Danish, Norwegian, Swedish and English cement practically will cease if the Customs Division of the Treasury Department finds that this imported cement is being dumped on the market here under the domestic cost of production. The Sun Portland Cement Co. and the Oregon Portland Cement Co. have filed petitions for the application of the Anti-Dumping Act of 1921 to cement imported from Norway and Sweden.

Should the Customs Division pass favorably on these applications the tariff on the imported cement from these countries would be increased in an amount equalizing the cost in the domestic market of the imported cement and cement of domestic manufacture. As foreign cement could not profitably compete under such conditions importations practically would cease.

E. W. Camp, Director of Customs, has informed the customs collector at Portland, Ore. that from evidence now before the Treasury Department, the issuance of dumping notices in the case of Danish, Norwegian, Swedish and English cement is justified, unless there is evidence to the contrary in specific importations, with the understanding furthermore, that the issuance of these notices will not be confined to cement from these particular countries.

There may be dumping in the case of cement from other countries, the instructions issued by Mr. Camp stated, and all importations of cement should be carefully considered in this connection. To determine finally whether dumping notices shall be issued, representatives of the Treasury Department abroad have been instructed to investigate and report as soon as possible the foreign market values back to April 1 of British, Norwegian, Swedish, Danish and German cement, and to forward any other information available bearing on the question of dumping this cement on the American market.

Disintegration of Cement in Sea Water

The disintegration of cement in sea water and the work done in the study of cement for use in sea water is reviewed with bibliography by W. G. Atwood and A. A. Johnson in the *Proceedings of the American Society of Civil Engineers.* The disintegration of concrete in sea water is attributed to the action of sulfates on the free lime of the set cement. The following is an abstract from the *Journal of the Society of Chemical Industry:*

> The authors conclude that the disintegration of concrete in sea water is essentially due to the action of sulfates on the free lime of the set cement. This may be avoided by the addition to portland cement of puzzuolanic material, the silica of which combines with the free lime and renders it insoluble, or by the use of high alumina cements, which do not give rise to free lime on hydration. The use of a standard cement seems inefficient, and the specifications should be varied to suit the conditions of use. The problem will only be solved completely by the development of a cement immune from attack by sulfate-bearing waters.

Further discussion of the subject in the *Proceedings* includes a statement that the original chemical composition of cements is no guarantee of their value. It is the chemical combination which takes place in the moist mortar which is the principal factor in their ability to oppose the destructive action of sea water. According to B. Jeanneret, Leige, Belgium, the combined silicates and not the mixtures of silicates produced after burning, are the agents which furnish the cohesive strength. It is for this reason that pure cements (portland, natural cements, well burned hydraulic lime) offer a much better guaranty of the value of a mortar than the mixed cements such as insufficiently burned lime rich in free lime. The value of adding trass, volcanic ash, etc., lies in the chemical reaction which they are able to cause. The more prompt the chemical reaction of the silicates to hydration, the more readily the gelatinization takes place and the consequent impermeability of the mortar.

Porosity is the second important factor governing the value of mortar and concrete in water.

Further discussion of the subject was to the effect that most of the tests or observations have shown that very little, if any, disintegration occurs where the concrete is constantly submerged, but that alternate wetting and drying are essential conditions and that even then it does not always occur, or occurs to varying degrees, although the same cement might have been used. If a porous surface is present and it is alternately wetted and dried, each flushing of the surface will fill the pores and each drying will leave a small deposit of the salt in them. A constant repetition of this process would cause concentration in the pores, which would hasten the chemical action and if saturation occurred, this would be accompanied by crystallization that would tend to disrupt the concrete.

The importance of the water content in concrete is emphasized, it being the opinion that plastic concretes give the best results, that is the concretes having the least quantity of water that will permit reasonably easy handling.

Protecting Conveyor Belts Against Wear

The *Revue des Materiaux de Construction et de Travaux Publics* of August, 1923, describes a method for saving conveyor belts carrying clinkers, coal, gravel, or the like from a lot of wear, by perforating the bottom of the loading spout with rather fine holes, so as to let the fine particles fall through, and cover the belt with a kind of cushion before receiving the larger particles, which otherwise would strike the belt directly and cause abrasions.

Such screens really could be used with profit as spout bottoms for belt loaders in grain elevators and mills as well, and seem to be a valuable improvement for such purposes.

Cement Kiln System Patented

A United States patent has been granted D. S. Jacobus for a cement kiln system in which the cement kiln gases are passed through a flue with heated refractory side-walls, whereby the dust cakes on these walls and is so removed from the gases. Baffles project at intervals a short distance from the walls causing eddies which bring the gases into intimate contact with the walls. The walls may be cleaned during operation.

Men and Mills

Notes from the Field

With the construction work at the new plant of the Sun Portland Cement Co., Lime, Ore. practically completed early in October, the company contemplated beginning operations not later than the 25th of the month.

J. E. Zahn of the United States Portland Cement Co. has been named a member of the committee to formulate ways and means for the organization of a branch in Denver, Colo., of the National Safety Council.

The chairman of the Red Cross Japanese Relief fund has received $223, a gift from the employes of the Vulcanite Portland Cement Co.

Charles Piez, president of the Link-Belt Co., Chicago, announces the purchase of the Meese & Gottfried Co. of San Francisco, Los Angeles, Seattle and Portland.

The improvement in distributing facilities effected by the consolidation and the additional manufacturing facilities acquired will give the rapidly growing industries of the Pacific coast highly economical and efficient service.

Meese & Gottfried Co. and its predecessors have been manufacturers of power transmission machinery and distributors of conveying and transmission machinery on the coast for more than 40 years. The new organization will be known as Link-Belt Meese & Gottfried Co., with headquarters at San Francisco.

Richard W. Yerkes, formerly general manager of the Link-Belt Co.'s Philadelphia plant, has been appointed treasurer of the Link-Belt Co., succeeding B. A. Gayman.

Mr. Gayman was selected to head the newly acquired Meese & Gottfried Co. of San Francisco.

Mr. Yerkes will be located at the Link-Belt general offices at 910 South Michigan Avenue, Chicago.

Actual construction work on buildings for the $1,250,000 cement plant of the Southwestern Portland Cement Co., Fort Worth, Texas, is well under way.

Carl Leonard, president of the Southwestern Portland Cement Co., who has been touring Europe in a survey of European cement manufacturing methods, has returned to Fort Worth.

It is regarded as almost certain that the Atlas Portland Cement Co. will continue operation of its plants in the Lehigh region throughout the winter, with the exception of a shutdown for annual repairs and overhauling.

A. A. Tucker, mill foreman in the grinding department of the Tidewater Portland Cement Co., Union Bridge, has resigned.

The Macdonald Engineering Co., Chicago, Ill., has been awarded the following contracts:

To design and build a cement stock house having approximately 150,000 bbls. capacity for the Southwestern Portland Cement Co. at Fort Worth, Tex.; to design and build an additional cement stockhouse and packing plant for the Dewey Portland Cement Co. at Dewey, Okla., with a capacity of approximately 125,000 bbls. and to design and build a cement stockhouse of approximately 125,000 bbls. capacity for the Marquette Cement Mfg. Co., at Cape Girardeau, Mo.

Cal Chemical Co., Inc., Hagerstown, Md., manufacturers of Cal concrete accelerator and curing compound, announces the recent opening of sales offices and warehouse facilities in Chicago and New York city.

The Chicago office at 327 So. La Salle Street, is in charge of A. S. Harrison, who is also vice president and Chicago manager of the Minwax Co.

The New York office at 30 E. 42nd Street, is in charge of M. F. Cavallon, formerly New York representative of the A. T. Malmed Co. and the Hy-Test Cement Co.

The C. P. Portland Cement Co., Ltd. of Kymore, India, now claims to have the largest plant in India. It consists of three kiln units, the first of which has been operating since May 1, 1923 and the second unit since September.

H. A. Reninger of the Lehigh Portland Cement Co., Allentown, Pa., was elected vice president in charge of Industrial Safety at the Twelfth Annual Safety Congress of the National Safety Council which was held in Buffalo, October 1-5. Mr. Reninger was also made a member of the Executive Committee.

The barn on the farm of the Pennsylvania Portland Cement Co., near Bath, has been destroyed by fire.

R. S. Conner, formerly chief chemist for the Peninsular Portland Cement Co., is now filling that capacity at the Signal Mountain Portland Cement Co.

A new rotary kiln has been installed and is now in operation at the Buffalo, N. Y. plant of the Kelley Island Lime & Transport Co.

Holders of preferred stock in the Oregon Portland Cement Co. have recently received checks covering dividend No. 9 of 7% on the outstanding stock. A similar dividend was paid July 2.

Since the latter part of 1921 the company has paid 49% in dividends, but inasmuch as the preferred shares were entitled to 7% yearly dividends, if earned, from January 1, 1916, 7% in dividends will be due at the end of the year.

Charles B. Herring, sales manager of the Ottawa Silica Co., Ottawa, Ill., died October 7, 1923, at Pasadena, Calif.

The frame of the large stone crusher at the plant of the Tidewater Portland Co. broke recently and several electric welders were required to repair the damage.

The Holland-America Line motorship Drechtdyk arrived at Portland, Ore., early in October with 47,760 sacks of cement from Europe.

The Westinghouse Electric & Manufacturing Co. has established a general engineering division at its South Philadelphia works, which will be devoted to the study of central station and industrial plant problems, involving the application of steam power apparatus such as steam turbines, condensers and reduction gears. This department will also cooperate with the sales organization in providing engineering service to purchasers of this equipment.

Machine Molded Gears

When a molded, grey iron gear, 14 ft. in diameter and with an 18-in. face, is so well made that after completion the gear is found to be less than one-sixteenth of one inch out-of-round, and each tooth to be exact in pitch, the process of manufacture is worthy of note.

The gear in point was made for a cement mill—a service demanding the very best in workmanship and materials, because of the ever present dust and grit in such mills.

The process of machine molding which was employed is illustrated by the accompanying figures. This process molds one tooth at a time, the pattern being a single tooth block, ordinarily made of brass, and machined to absolute accuracy.

The tooth block is mounted on the ram of the gear molding machine. This ram or head is adjustable, so as to give the correct pitch diameter. The ram is also movable up and down, so as to bring the tooth block in position for holding the teeth, and so it can be removed while the table is being rotated.

The flask is placed on the table of the machine and properly centered. The table of the machine is rotated by hand, through a series of gears. This gives the table a slow action and enables it to accurately index the proper number of teeth. The tooth block is placed in position in the flask, and the tooth is rammed up by hand. The tooth block is then withdrawn from the flask, and the table rotated the exact amount necessary to bring it in position for the next tooth. This process is repeated until all the teeth have been so molded.

The arms are made in cores, or in green sand, depending somewhat on the size of the gears, etc. The making of the arms differs in no way from ordinary molding.

Because of the fact that the teeth are accurately indexed and the single tooth pattern has no draft, being drawn up through a stripping plate, and because more time can be spent on a single tooth than it would be possible to spend on each tooth of a full pattern, the machine molded gear is necessarily very much more accurate than any pattern molded gear could be. And, though it might appear that machine molded gears would be far more costly than pattern molded, the opposite is true, especially in the cases of the larger sizes.

All these gears are made from a special mixture, ranging on the average about 20% steel and 80% grey iron. This very materially increases the tensile strength of the final product. Grey iron ordinarily possesses a tensile strength of 18,000 to 20,000 lbs. per sq. in. of cross section, while the mixture including steel will raise this tensile strength to 25,000 or more.

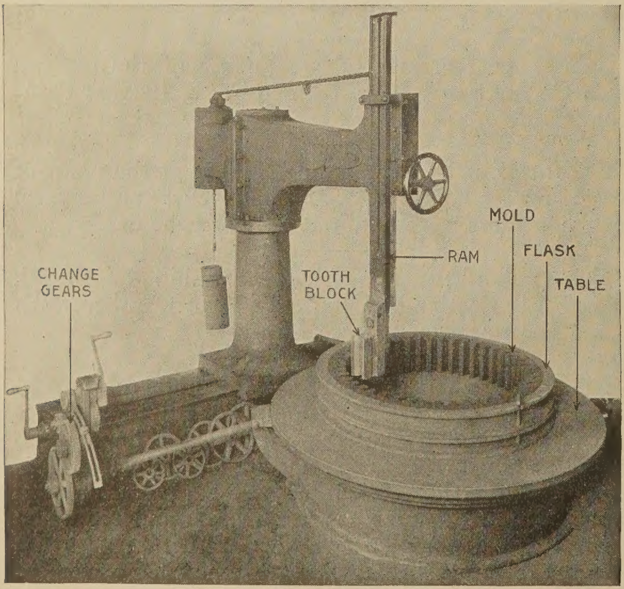


Fig. 1—Gear Molding Machine

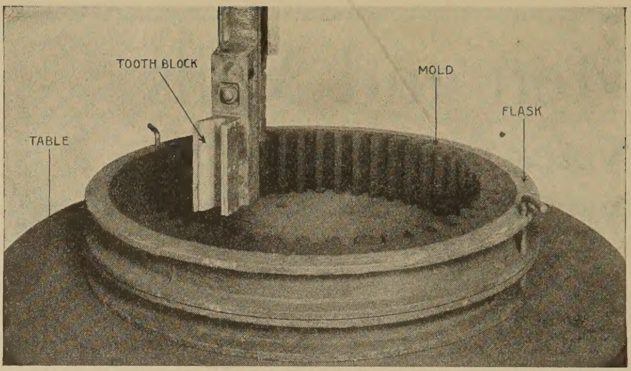


Fig. 2—Close up View of Tooth Blocks

Machine molded gears have a surface chill and hardness to resist wear. Very often this hard, chill surface extends ⅛ in. under the surface, which of course insures longer life and a better wearing surface.

The accuracy with which machine molded gears are made tends to decrease the power imput and lengthen the life of the machine or mill being operated.

The 14 ft. gear was made by the H. W. Caldwell & Son Co. plant of the Link-Belt Co., of Chicago, from whom the above information was obtained.

Potential Transformer Fuses

A line of enclosed cartridge type potential transformer fuses and fuse blocks in voltages of 2500 to 25,000 for the protection of indoor potential transformers has been placed on the market by the Westinghouse Electric & Manufacturing Co. They can also be used to protect other circuits where the current does not exceed one-half an ampere.

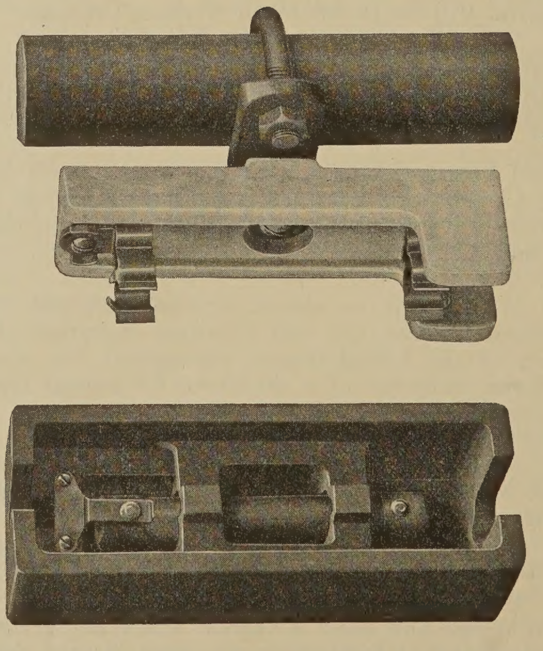


Fig. 1—2500 Volt Fuse Block, Open to Show Method of Mounting the Fuse in Covers

The fuses can be applied without preventive resistances in locations where the maximum short-circuit current does not exceed the interrupting capacity of the fuse. When a preventive resistance is used the short circuit current will be limited, irrespective of the power back of the fuse, to a value within the interrupting capacity of the fuse. For 15,000 and 25,000 volt service the same fuse is used, with a different preventive resistance to limit the current and a different fuse base for each of the two voltages.

The 2500 volt fuse base is provided with a cover of molded insulation which holds the fuse and provides for its safe handling. The higher voltage bases use corrugated post type insulators.

Some of the special features of these fuses and fuse blocks are their high interrupting capacities, strong non-absorbent fibre casings,, and their construction providing for the proper venting of gases.

Market for American Cement in Cuba

Importation of cement from the United States into Cuba in 1922 showed a decrease of 65% in quantity and 53% in value as compared with 1920. A large percentage of this decrease was no doubt due to the suspension of practically all construction work during the financial depression through which Cuba has just passed, the total consumption of cement in the island having decreased 47% during this period. Shipments of cement from the United States to Cuba during the past four years have been: 1922—443,391 barrels; 1921—447,706 barrels; 1920—1,275,169 barrels; 1919—1,061,786 barrels. In 1920 (the latest year for which figures of imports from all countries are available) the remainder of the imports of cement into Cuba came mostly from Canada (40,507 barrels), with the Netherlands, France, Belgium, and other countries making small contributions.

A higher rate of duty levied on imports from countries other than the United States and slightly higher ocean freight rates have served to offset any price advantage that European exporters might have had through cheapness of labor. While several European countries have previously enjoyed a share in the cement trade, the greatest competition of the present and future is furnished by local manufacturers. The domestic product, which is manufactured by the "wet" process, and is equal in quality to that imported, amounted to 500,000 barrels in 1922, 435,000 barrels in 1921, 460,000 barrels in 1920, and 310,000 barrels in 1919. An advantage is had by American exporters over the local manufacturers in that the combined steamship and railroad freight charges on cement exported from New York destined for the central or eastern interior of Cuba are from 10 to 20% less than the railroad freight charges from Habana, notwithstanding the local producer is allowed a small preferential rate by the local railways.

An extensive advertising campaign is now being carried on by a local factory, no doubt in view of the fact that the economic situation has improved considerably in the past six months and that a large amount of construction work will take place this year. It has been unofficially stated that work will be resumed in the near future on a number of Government projects which were suspended during the financial depression. In this event the consumption of cement for 1923 would be greatly increased. *Commerce Reports.*

Overburned Lime Causes "Popping" in Plaster

Lime which has been overburned or which has been burned during hydration is the cause of popping in plaster, tests made at the Bureau of Standards have shown. In this type of failure small particles appear to expand and push themselves out of the plaster, leaving tiny holes. In extreme cases these holes may be sufficiently large or numerous to be unsightly. It has been shown that popping will not be serious if the lime is ground fine enough to pass a number 50 sieve, as in that case the lime will be comp'etely hydrated during the mixing and application, or else the particles of defective lime will be too small to cause noticeable holes.

These tests were made in cooperation with the National Lime Association, the Contracting Plasterers Association, and the International Plasterers Union. Ninety-eight panels were erected containing different impurities in different sized particles. It was found that with the possible exception of sand, impurities other than overburned lime did not cause popping no matter how coarse they were.

Growing Demand for Pulverized Coal

Coal operators, who are noting with interest the growing demand for finer and finer coal, are wondering if the practice will advance so far that mining officials will be interested more in getting fine coal than in procuring lump. Should such a situation come about, the whole process of mining coal would probably be revolutionized, as well as the methods of transportation, and there is a possibility that a type of tank car would be developed to carry pulverized coal.

Pulverized coal has been used by the cement industry for about 25 years, or since the development of the rotary kiln in which the raw materials for cement manufacture are burned. It is estimated that over 5,800,000 tons of pulverized coal were burned at cement plants of this country last year. The coal is generally ground so fine that 85% of a given quantity will pass through a sieve having 40,000 holes to the square inch, or a sieve that is finer than a silk handkerchief. Cement mill practice has determined the fact that fine grinding tends to shorten the flame and make it hotter, and as temperatures of between 2700° and 3000° F. are required in the kilns, finely pulverized coal has been found to work best.

Approximately 200 lbs. of coal are burned at cement mills for every barrel of cement produced, about three-fifths of the coal being pulverized for kiln burning. The coal dust is blown into the kiln through a pipe in one end and ignites with a roar, like a gigantic blow-torch. At the present time the cement industry is the fourth largest consumer of coal in the country, and the largest consumer of pulverized coal.

The possibility that the state of Missouri will build its own cement plant and compete with manufacturers who have been supplying that commodity for road building is being considered. Recent bids received by the Highway Commission named $2.40 a barrel as the price to the state which it is claimed is the same charged contractors for small lots. State requirements call for 400,000 barrels a year and the commission contends it should be able to buy at $1.50 to $2.00 per barrel.

New General Manager for Lime Association

Burton A. Ford has been selected secretary and general manager of the National Lime Association. This action was taken at a regular meeting of the Board of Directors, held in Chicago on October 11, 1923.

For the past three months Mr. Ford has been acting secretary of the Association, having been appointed to this position at the annual convention held last June. He is a graduate of the University of Maryland, and until the summer of 1922 was with the Virginia-Carolina Chemical Co., in the capacity of division manager, and was also secretary treasurer of the Bryant Fertilizer Co. In the summer of 1922 he became assistant to W. R. Phillips, who was then general manager of the National Lime Association, so he is thereby well qualified to handle his present position.

Trade Publications

Kennedy Products, General Catalog, Seventh Edition, Size 6 in. x 9¼ in., 164 pages; paper covers; Kennedy-VanSaun Mfg. and Eng. Corp., 50 Church St., New York city. This is a very attractive and complete catalog describing Kennedy products including crushing, mining, cement, screening, elevating, conveying and pulverized coal machinery.

Advanced designs, best obtainable materials and high grade workmanship are claimed for the various pieces of equipment described. Not only are the products described, but brief outlines are given of the processes in which the equipment can be used to advantage.

General dimensions for Kennedy crushers are given, together with suggested layouts for connecting equipment.

Osgood Again Steps Forward, Bulletin No. 236, just issued by the Osgood Co., Marion, Ohio, describes and illustrates the company's new 1½-yd. heavy duty steam shovel recently brought out. The company's objective in designing the machine is given as that of producing a revolving steam shovel of the 1½-yd. type for the heavy work that it will be called upon to do without in any way sacrificing its speed, simplicity or ease of operation.

Catalog No. 30, issued by The Brown Instrument Co., Philadelphia, Pa., describes Brown electrical indicating and recording CO_2 meters. The catalog is 8 in. x 10½ in., 8 pages, illustrated. The new electrical recorder shown permits of indicating and recording the CO_2 at any distance from the boiler and a combined meter is described which will record the temperature of the flue gas and the CO_2 contents on one chart, the instrument showing continually the percentage of CO_2 and not the results of the analysis of a sample as with chemical CO_2 recorders.

The Hauck Venturi Low Pressure Oil Burner is described in Bulletin No. 506 just issued by the Hauck Manufacturing Co., Brooklyn, N. Y. The bulletin is 6 in. x 9 in.; 8 pages; describing and illustrating the new oil burner and its many uses in connection with furnaces, ovens and tempering baths.

Jos. W. Hays is just completing the organization of a corps of consulting combustion engineers to be known as Jos. W. Hays and Associates. The headquarters of the organization will be Michigan City, Ind.

Jos. W. Hays and Associates will be prepared to render consulting service in steam plants in all parts of the country. Every man in the organization will be a combustion expert of wide practical experience.

A new dust collector has been installed in the bag house at the Louisville Cement Co.

We need a Mechanical Engineer for the designing and developing of pulverizing machinery. Must be first class man with good training and experience. Prefer one who has had experience in cement mill machinery. Give complete data regarding training, experience, capabilities and salary in first letter. Apply, Bradley Pulverizer Co., Allentown, Pa.

BETTER
RESULTS

Mr. Lime Man:-

You may have been operating your plant year after year in the same way, believing that you were getting the best possible results—but this is a mighty swift age and new methods of doing things are being invented every day---methods which help you to get better results from your lime kilns, your hydrators, your entire equipment.

These are methods you should know about.

Write for facts concerning:

The "ARNOLD" Vertical Lime Kiln
and the
"WEBER" Batch Lime Hydrator

Sold only by

ARNOLD & WEIGEL

Contractors and Engineers
Woodville, Ohio, U. S. A.